The FOUNDRY

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Castings Create a Breeze To Comfort the Traveler

THE Twentieth Century Limited, as it eases out of the Grand Central terminal in New York, or the Broadway Limited, as it departs from the new Union station in Chicago,, probably are typical of the finest railroad rolling stock and motive power in America. Railroad executives today are bending every effort to obtain the best locomotives and the most luxurious cars for these crack trains. The long and difficult journey of our fore-

Castings provide Many Comforts for the Traveler on America's Crack Trains

fathers, who first ventured from the Atlantic seaboard as far west as the shores of Lake Michigan, now has been reduced to 20 hours, with every comfort provided. From the barber shop in the front end of the club car to the spacious observation platform on the rear of the train, service is the watchword, with every company employe intent on providing comforts for the traveler. Many castings are used on the latest types of club cars, sleeping cars, dining cars and observation cars. These provide both beauty and utility. An interesting example of an artistic casting which also adds to the comfort of the traveler, is found in the modern dining car. It consists of a covering for the electric ventilating fans and is made up of two sections, one part being the frame and the other a revolving grid which directs the air uniformly to all parts of the car. This is only one of the many castings used on the dining car of the modern *deluxe* train.

Find Where Castings Can Be Sold

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Specializes

IN CAST IRON PIPE for Well Over a Century

Equipment and Methods Have Been Developed To a High State of Perfection for the Manufacture of a Standardized Product

By Pat Dwyer

ANY person curious enough to investigate the published history of cast iron pipe making will be surprised to note how cleverly the historians skipped nearly all reference to the manner in which the castings were molded and poured. Reference is made to cast-iron water pipe laid near Paris by order of Louis XIV as far back as 1664 and of other pipe laid in the years which followed, to carry water to the famous fountains of Versailles, where the high stepping Louis is credited with having spent 150,000,000 francs, partly for the honor and glory of France, but principally for the honor and glory of one Louis XIV.

Pipe varied in size from 13 to 20 inches and the several pipe lines varied in length from 1 to 2 miles. The pipe sections are short—1 meter, a little over 3 feet—and are bolted together through flanges on the ends. The present tense is used advisedly in this instance since these pipes still are in existence and functioning as bravely as they did in the days when Louis and his favorite mistress—for the time being—strolled on the graveled walks in the moonlight and admired the falling spray from the fountains.

On account of the flanges, the seam along the center on each side and other contemporary evidence one is fairly safe in assuming that these pipes were molded and cast horizontally. The same reasoning applies to descriptions and illustrations of iron pipe cast in the seventeenth and eighteenth centuries in several European cities.

A curious commentary is afforded in several instances on the wearing quality of cast-iron pipe. Records show that flanged, cast-iron pipe lines in London had to be taken up and relaid on account of the bolts rusting, thus loosing the joints and permitting the water to leak through. In the quaint English of the day the joints *perished.*

About 1785, Thomas Simpson, water engineer, Chelsea Water Co., London, designed the first bell and spigot pipe and had an experimental section laid with lead joints. The experiment was so successful that the entire systems of all the London companies gradually were relaid with this type of cast-iron pipe, some of which now have

Fig. 1—(Above)—Sweeps and Skeleton Patterns Are Used Extensively in the Foundry Where Large Special Fittings and Other Castings Are Made

Fig. 2—(Below)—Dry Sand Cores for Elbows, Gate Valves and other Special and Standard Fittings Are Made in Halves and Afterward Pasted Together

been in continuous service for 135 years. None of the published accounts contains any reference to the manner in which these pipe were molded and cast, but the few stray bits of available evidence seem to indicate that they were made practically in the same manner as they are made at present, that is on end in dry sand molds. No seam is visible on the sides of the pipes which have been taken up and it is highly improbable that this feature would be missing if the molds were made horizontally.

Fig. 3—(Below)—A Great Variety of Molds Are Made on a Jolt Rollover Machine With a Table 5 x 6 Feet

Fig. 4—(Above)—Patterns for Hydrants Are Adjustable and May be Arranged to Form Castings Varying in Length

Without in any way detracting from the credit due Thomas Simpson for the design of the bell and spigot water pipe, still a reasonable measure of credit also is due to the first foundryman courageous enough to cast a long pipe in a vertical position. Many foundrymen today without pipe making experience would hesitate to attempt it. With characteristic modesty the first foundryman effaced himself and no record is available to show who or what he was, where he cast the first pipe vertically or what argument was advanced by the designer to induce him to depart so radically from accepted practice. Between Simpson and the foundryman the cast-iron pipe industry was revolutionized and, incidentally, the problem of sanitation and water supply was solved in every large community.

The first cast-iron water pipe laid in the United States came from England early in the nineteenth century. Only recently some of these pipes were dug up in Philadelphia and found to be in excellent condition. They range in size from 4 to 20 inches, in standard 9-foot lengths and of the familiar bell and spigot type. Equipment and methods have improved to a considerable extent in the past 100 years, but the design of the pipe still remains the same and constitutes a remarkable tribute to the inventive mind of the man who first conceived it.

Apparently the process of casting water pipe on end was fairly well

Fig. 5—Elbow Castings and Other Castings of the Same General Character Are Molded in Pairs So That the Two Cores May Anchor Each Other

Fig. 6—Patterns for Gate Valves and Other Symmetrical Castings are Mounted on Stripping Plates and the Molds Are Rammed on a Plain Jolt Machine

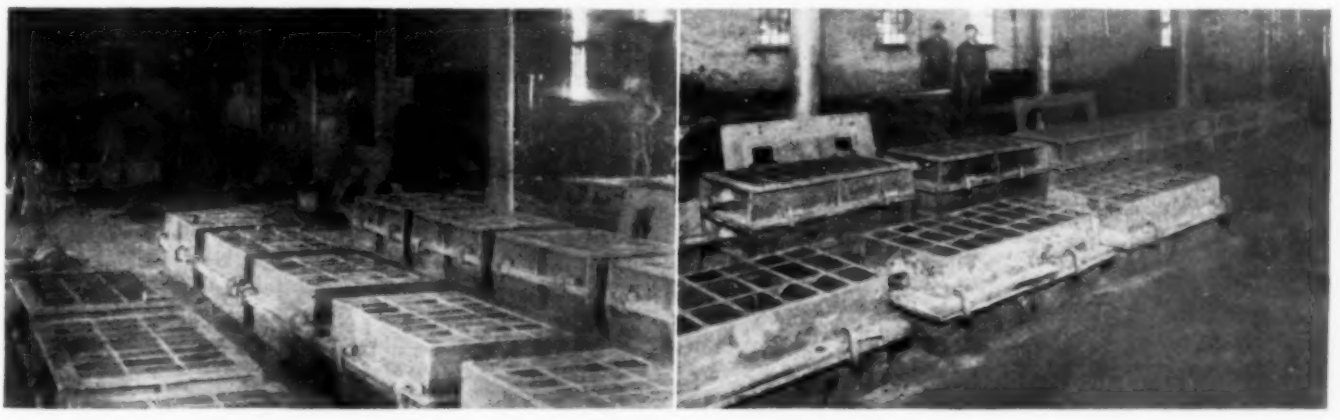


Fig. 7—(Above)—Hay Rope is Wound Tightly Around the Core Barrel Before the Loam is Applied to Form Finished Surface of the Pipe Core

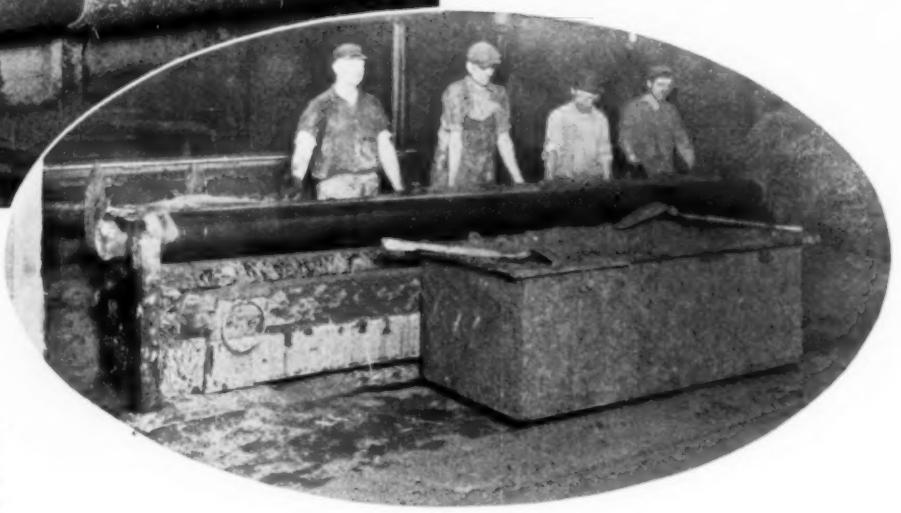


Fig. 8—(Below)—A Thin Finishing Coat of Blacking is Swept on the Pipe Core Instead of Being Applied With a Brush in the Usual Manner

established in England, before it was commenced on this side of the Atlantic, but after the industry became established in the United States its growth was rapid and in keeping with the growth of the population and the installation of public utilities.

Occasionally in recent years foreign made pipe has been imported into the United States, but this has been traceable to economic factors and in no way can be taken as an indication that the pipe producing capacity of the country is not equal to all demands. Naturally the great majority of pipe foundries have been designed, erected and placed in commission in comparatively recent years, but several are in position to trace their history back for a considerable period. In some instances the properties have passed through the hands of several interests, something that seems almost inevitable in manufacturing any commodity, while in others the control has passed from hand to hand, but the ownership has remained in one family.

Early Pipe Makers

Philadelphia was among the first, if not actually the first American city to specify cast-iron water mains and that probably accounts for the fact that the first pipe shops were established across the Delaware river in New Jersey close to deposits of molding sand particularly adapted for making dry sand molds.

About 1803 David Wood commenced making cast-iron pipe at his shop in Millville, N. J., and members of his family have continued to make pipe ever since, first at Millville and later at Florence, N. J., where a new shop was erected in the late sixties to meet increasing demand. The firm is known as R. D. Wood & Co., and for many years has been managed by Walter Wood, dean of Philadelphia foundrymen, and son of the original R. D. Wood who built the first part of the plant in Florence. Mr. Wood also is well known internationally through his connection with a committee that has spent considerable time trying to arrive at a mutually acceptable type of international test bar for gray iron.

The first unit of the Florence plant still is in existence and pipe still are made in it. The heavy, cumbersome jib cranes that once served the pits have been removed and replaced with overhead electric traveling cranes, but the circular pits have not been changed. This shop now is used entirely for the production of the larger size pipe in standard lengths. Odd lengths, special shapes and heavy fittings are molded and cast in an adjoining building.

As conditions seemed to warrant, the plant has been extended many times during the period it has been in existence. The latest addition is a large building erected and equipped for the production of cast iron pipe by the so-called sand spun process, that is centrifugally in sand lined metal molds. This part of the plant has been described in THE FOUNDRY, Feb. 15, 1928. In addition to this department and the original foundry, the present plant includes a large and strictly modern pipe shop in which the pits extend longitudinally the full length of the building; one general jobbing foundry; one fittings shop and a brass foundry. The great bulk of the castings made in the jobbing foundry are for hydraulic installations and pumping plants. All kinds of fittings, standard and miscellaneous, are made in a third foundry devoted entirely to this class of castings. A wide range of brass and bronze castings for hydrants, pumps and miscellaneous machine parts is made in the brass foundry.

Pipe Foundries

Several machine shops are operated on the premises, besides a wood working and pattern shop, blacksmith and structural shop and other auxiliary departments required for the successful operation of a large self contained manufacturing establishment. Even the manager's house is located on the company's property a short distance from the office.

The town of Florence practically is built up around the plant which gives employment to the greater part of the adult male population. A great number of women and girls are employed in a thread factory erected many years ago by the R. D. Wood Co., with the specific object in view of furnishing employment to this branch of the population and thus maintaining a self-contained and satisfied community. The plant as a whole presents many interesting features, but the scope of the present

description is confined to the four iron foundries.

On account of the severe service to which they are subjected, the flasks, core barrels and other equipment for making cast-iron pipe are unusually strong and substantial. The heavy cast-iron flasks are flanged and ribbed vertically and horizontally on the outside and are designed to fit closely with not more than 2 or 3 inches of sand between the flask and the casting. Each flask is split in two vertically, hinged at one side and held together with clamps on the opposite side. This construction keeps each pair of halves always joined, facilitates removal of the sand and casting, and only leaves one side to be clamped and unclamped each time the flask is used. The flask is pierced with numerous vent holes and is provided with loop handles by which it is manipulated by the crane.

In specialized work of this kind men become unusually adept, but the cranemen seem to develop a higher technique than any of the other employes. The judgment, skill and speed they display in hooking the flasks and arbors at times seems positively uncanny. Frequently the hoist, bridge and rack control are on at the one time and in addition the block is given a pendulum motion that causes the load to sway one way or another as cleverly as a juggler balancing on a pyramid of chairs. Ability to handle a crane with ease and speed is a gift. Men who have this gift can develop it to a high state of perfection. Men lacking the gift may learn to handle the various controls, but they never become confident or speedy. Where one man rouses the spirit of emulation and acts as a pace maker, the second man is a drag and arouses hostility among men on the floor who have a day's work to do and want to get it done.

Old and New

In the old foundry where the large pipes are made one in a flask, the sand is rammed with long pneumatic rammers. In the newer foundry where smaller size pipe are made two in a flask, the molds are jolted on machines made by the Herman Pneumatic Machine Co., Pittsburgh. The large flasks are mounted on a turntable which revolves during the ramming operation so that the man shoveling sand into the flask and the men operating the rammers do not have to change their positions. In the other shop the sand is fed into the top of the flask through a chute from an overhead bin. Other features in the sequence of operation necessary to the production of a pipe casting practically are the same in both shops.

The metal pattern accurately turned to size and highly polished through constant use, is in two parts, the short part for forming the bell end of the pipe and the remainder to form the long straight shaft. The pipe is molded with the bell end down. Afterward the mold is dried and cast in that position.

Large pipe cores are made by winding a hay rope around a cast-iron or steel barrel and then covering the hay rope with approximately a 1-inch thickness of loam. A strip of heavy corrugated cardboard takes the place of hay rope on small cores. The barrel is placed in a simple type of power-driven lathe controlled by a treadle extending the full length of the machine. The operator wets the barrel to give the hay rope a grip, then he starts the machine and commencing at one end, applies the hay rope in a close spiral to the other end. A coating of loam then is applied by hand to the revolving barrel until the shape of the core is roughly outlined. This core then is placed in the oven for an hour or two, after which it is replaced in the lathe and a finishing coat of loam is applied. A fixed straight-edge attached to the frame of the lathe and extending from end to end, removes the superfluous loam and imparts a finished surface to the core. A coating of blacking mixed to the consistency of jelly is applied in the same manner and then the core is returned to the oven for a final drying.

A natural loam indigenous to the district is employed in making the cores. No foreign material is added to it. Like a widely advertised food it is only necessary to add water and serve. Cores are made and dried in a horizontal position. After the final drying they are taken from the oven and turned up on end by the simple expedient of hooking them at both

Fig. 9—(Above)—Hydrant Cores Are Made in the Same Manner as Ordinary Pipe Cores With the Single Exception That the Diameter is not Uniform Throughout the Entire Length

Fig. 10—(Below)—Machines for Spinning Hay Rope

ends to swing clear of the core oven car. Then while one end is held stationary or lowered a little, the other end is hoisted until the core assumes a vertical position. The lower hook then is disengaged and the crane is centered over the mold where the core is lowered into place.

Molds are not dried in an oven. Each green mold is located over an opening in an iron plate through which heat from a gas jet ascends and dries the inside of the mold. The thin coating of sand inside the flask dries readily in a few hours.

Stools on which the pipe molds are supported before and during the casting process are fitted with lugs on the outside to guide the flask and with a print in the center to receive the short section of the core. This core is built around an iron ring which serves as a guide and a seat for the main core when it is lowered into place. The socket core is set first, next the flask is lowered into place and then the long main core is lowered into the mold. Necessity of providing adequate head room under the crane is one of the reasons why cast-iron pipes are molded and cast in a pit. Other reasons of course include the ease with which the flasks are filled with sand and later the ease with which the molds are filled with molten iron. The pit is 10 feet deep so that the top of the pouring basin on a 12-foot pipe mold is approximately 3 feet above the floor level. This distance ordinarily is sufficient to clear the ladle and bring the lip close to the pouring basin.

A flat ring core placed in a suitable print at the top of the mold serves as a cover for the pipe mold, and also clips the main core closely and automatically centers it in the mold. This ring core is pierced with a number of small openings through which the iron enters the mold. The number of openings and their size depend on the size of the pipe. The main core projects above the ring for some distance and serves as the inner boundary of a pouring basin, the outside of which is formed by a ring core with a wall about 6 inches high.

Almost immediately after the pipe is poured the iron in the runner basin is broken either with a pinch bar or with the hook of the crane. The crane then is hooked to the core barrel and it is lifted out of the pipe and returned to a point close to the lathe on which the cores are formed. The flask then is lifted out of the pit and skillfully laid down on its side on a rail skidway. The clamps are knocked from one side. The flask is opened and the pipe rolls down the skidway while the sand falls out of the flask on the floor. The flask then is reclamped and is again ready for use. Sand is wet down with thin claywash and cut over in a huge pile for the following day.

After the pipes have cooled they are taken to the cutting off machines. Present day practice favors casting the pipe from 3 to 6 inches over the required length to insure solid metal at the upper end. The pipe is placed in a lathe where one tool cuts off the superfluous ring while a second tool forms the familiar bead at the spigot end. The pipes then are heated and dipped in a pitch bath. Afterward they are tested hydrostatically under a pressure of 300 pounds per square inch. While the pipe is under pressure an inspector taps it sharply with a hammer. Specifications governing water pipe are unusually severe and as a result the manufacturing process has been developed to a high state of perfection. Based on the tonnage involved the number of pipe castings rejected is exceedingly low.

Large, bulky, special and odd fittings are made in loam molds in the foundry partly shown in Fig. 1. Owing to the character of the work this shop bears a striking resemblance to a place that has just been through a fire or a cyclone, but that impression is only superficial. Piles of brick clutter the floor here and there, but they either represent a mold that just has been removed from around a casting, or a mold in process of building. Sweeps are employed here freely, also skeleton patterns and a high degree of skill is required on the part of the molders. Usually only one casting is made from each pattern. Pits are provided for exceedingly large castings, but a great many molds are enclosed in sheet steel curbings above the floor level.

Employ Molding Machines

Patterns for standard fittings made in the miscellaneous green sand foundry are mounted on boards and molded in iron flasks with interchangeable parts. Plain jarring machines or roll-over machines similar to those shown in Figs. 3 and 6 and made by the Herman Pneumatic Machine Co., Pittsburgh, are located at strategic points for filling the floor with molds in the immediate vicinity. Small cranes and monorail hoists are available wherever needed. A corner of the coreroom and one of the core ovens with loaded cars in front of the door are shown clearly in Fig. 2.

In many instances the core is symmetrical and for that reason a single half corebox is all that is required for making the cores. The half-cores are pasted together after they have been dried. A typical half-box may be noted to the right of the core oven car in Fig. 2. The core from this box is designed to serve two castings in the one flask and automatically hold itself in place without the use of chaplets. Many elbow and bend castings are molded in this manner.

Many of the features connected with making 6 and 8-inch pipe cores are shown in the illustrations Figs. 7 and 8. Loam core making for hydrants is shown in Fig. 9. A few of the machines on which the reels of hay rope are twisted are shown in Fig. 10. The operator places an empty spool in the machine driven by an overhead belt and controlled by a clutch and pedal. He sits on a low stool and feeds hay from a loose pile into the machine which twists it and coils it on the spool.

Booklet Describes Line of Sand Equipment

The National Engineering Co., 649 West Washington road, Chicago, recently has issued an interesting booklet on sand handling and preparing equipment. The first section of the publication is devoted to a discussion of the application of sand handling and preparing equipment in the foundry. That section includes information on the use of sand equipment in foundries specializing in machine tool castings, engine castings, and steel castings. Mixing processes for foundry molding sand, backing sand, facing sand and core sand are discussed and the rebonding and reclaiming of foundry sands is described. The second section of the booklet is devoted to descriptions of various types of sand mixing and handling machines manufactured by the National Engineering Co., including the various sizes of muller type machines, the continuous sand mixer, the bucket loader and the laboratory mixer.

Head Indianapolis Group

W. D. Hamerstadt, Henry Langsenkamp and Frank O'Neil have been elected executive committee members of the Foundrymen's Association of Indianapolis. Officers are: President, T. J. Cornwell; vice president, Guy E. Street; treasurer, James H. Hooker. A. J. Allen was re-elected secretary for the twenty-fourth time.

Lay Groundwork for

Gray Iron Institute

Pittsburgh Conference Outlines Problems of Gray Iron Foundries and Establishes Skeleton Structure for Trade Association

IN RESPONSE to a joint call sent to an invitation list supplied by a committee of the Philadelphia Foundrymen's association and a small group of western foundrymen, fifty-four foundrymen and those directly interested in the gray iron industry met in conference at the Carnegie Institute of Technology in Pittsburgh March 13. B. H. Johnson, Cresson-Morris Co., Philadelphia, who was chairman of the Philadelphia committee, was chosen to act as chairman of the conference and Dan M. Avey, editor of THE FOUNDRY, Cleveland, was requested to serve as secretary.

Walter Wood, president, Philadelphia Foundrymen's association, outlined the necessity for co-ordinating interests and efforts of gray iron foundrymen along national lines. He stated that the legitimate field of gray iron castings has been trespassed upon, not only by other cast products, but by various fabricated metals. The success attending these encroachments has been due largely to the negligence of foundrymen in not finding out their own problems and solving them. He stated that gray iron castings should be improved and the public should be advised what results are obtained along these lines.

A. F. Jensen, president, Hanna Engineering Works, Chicago, gave an interesting address on the way in which other products have been advertised and merchandised through group effort. He told of motion pictures, addresses, papers and advertisements, all supplemented by educational work to show the merit of products which are competing with gray iron castings in various lines of manufacture.

Mr. Jensen mentioned in particular a recent conference on welding at the University of Wisconsin on which occasion the riveting interests presented a film to counteract some of the claims made for welding and successfully presented the merits of riveted products and structures. Mr. Jensen deplored the exaggeration which has accompanied some claims in support of welding as opposed to castings. He cited some statements referring to castings costing 20 cents a pound and greatly enlarging the pattern costs for purposes of comparison. He recommended a study of the admirable features of cast iron, particularly its strength under compression, rigidity, resistence to corrosion, etc., as possible lines of endeavor for the gray iron interests. Mr. Jensen summarized the efforts of

Lays Down Principles of Proposed Institute

WHEREAS, for some time past the gray iron foundry business has been confronted by a series of unusual conditions which has affected that industry adversely.

WHEREAS, what is known as hand-to-mouth buying has been prevalent in the industry for some time supplanting long term contracts which formerly governed and formed the practice of many buyers in placing orders for castings.

WHEREAS, a tremendous over capacity exists in the gray iron foundry industry throughout the country.

WHEREAS, gray iron castings for some time past have come into competition with other products and the latter have made further inroads on the market for gray iron castings.

And because of all the foregoing and for many other important reasons—

BE IT THEREFORE RESOLVED that an organization be formed consisting exclusively of those engaged in the production of gray iron castings; this organization to be known as the Gray Iron institute; this organization to be formed for the following purposes among others that may later be decided upon:

1. *To make intensive study to improve the quality of gray iron castings and increase their utilization in industry, and to study foundry costs.*
2. *To study hand-to-mouth buying to ascertain whether it is here to stay.*
3. *To study the facilities at present existing in the foundry industry to determine if over-capacity exists.*
4. *To study new methods for merchandising gray iron castings.*
5. *To study methods to strengthen present markets for gray iron.*
6. *To develop new markets and ascertain new products for manufacture.*
7. *To study the possible liquidation of unprofitable foundries and turn their facilities into other channels.*
8. *To study the possibility of consolidation or merging and strengthening of foundry companies.*
9. *To discourage building of additional foundry capacity for some period in the future.*
10. *To encourage users of castings at present operating foundry departments again to purchase their castings in the open market.*
11. *To study the use of advertising and publicity in its many ways for the purpose of merchandising gray iron castings.*

different groups, mentioning individual cases and showing specimens of group advertising and sales literature.

Explains Problems

Walter L. Seelbach, Forest City-Walworth Run Foundries Co., Cleveland, presented a paper outlining various factors affecting the gray iron industry. An abstract of this paper appears in this issue of THE FOUNDRY.

An interesting communication from Dr. Richard Moldenke, at present in Germany, was read by John L. Carter, Barlow Foundry Co., Newark, N. J. Dr. Moldenke outlined the views on foreign association work and suggested technical research as the prime purpose of a gray iron organization.

A. J. Tuscany, secretary, Ohio State Foundrymen's association, Cleveland, presented data on the aims, accomplishments, budgets and expenditures of various trade associations in other lines. These varied in one industry from where 87 members are expending $3,750,000 per year to those in which only a few thousand dollars are available for research or merchandising effort. Mr. Tuscany showed that the average dues of six associations, comparable in value of annual production to the gray iron industry, is $750 apiece and he outlined the accomplishments in increased use of products obtained throughout the industry by this rather modest annual promotion fund.

C. E. Hoyt, secretary, American Foundrymen's association, Chicago, presented his personal good wishes in the effort which gray iron foundrymen are making to solve the problems which are facing the industry.

John Hartman, Atlas Foundry Co., Tacoma, Wash., official representative of the Washington Foundrymen's Club, spoke of the problems which are confronting gray iron foundries on the west coast and expressed a desire to co-operate in any way that might be found desirable.

Philip Frankel, Cleveland, spoke briefly on the changes and fluctuations in the volume of foundry business as shown by reports coming from his membership. In years past these fluctuations were periodical, ranging up and down with the general business trend. Recently the tendency has been downward for the past several years. He deplored the hand-to-mouth fashion of buying as applied to castings and stated that the over-capacity, which he believes exists in the industry, should be eliminated by merging and consolidating plants and business structures.

Varied Opinions

After general discussion many valuable viewpoints were contributed by the following speakers: William H. Barr, National Founders' association, Buffalo; James T. MacKenzie, American Cast Iron Pipe Co., Birmingham; E. A. Custer, Jr., Philadelphia; Horace R. Culling, Carondelet Foundry Co., St. Louis; A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.; A. G. Wessling, Wessling Bros. Foundry Co., Cincinnati; W. B. Coleman, Philadelphia, and James D. Coltman, Bullard Machine Tool Co., Bridgeport, Conn.

Walter L. Seelbach offered a resolution proposing the establishment of a gray iron institute. This resolution was seconded by Robert Crawford, Atlas Foundry Co., Detroit, and unanimously adopted by vote of all of the gray iron foundrymen present. Walter Wood then proposed a nominating committee to select an organization group of fifteen gray iron foundrymen and two alternates. This committee after consideration presented the following names to form the organization committee: J. H. Bruce, Bowler Foundry Co., Cleveland; J. L. Carter, Barlow Foundry Co., Newark, N. J.; H. S. Chafee, Builders' Iron Foundry, Providence, R. I.; J. D. Coltman, Bullard Machine Tool Co., Bridgeport, Conn.; Horace R. Culling, Carondelet Foundry Co., St. Louis; Fred Erb, Erb-Joyce Foundry Co., Detroit; W. J. Grede, Liberty Foundry Co., Milwaukee; A. E. Hageboeck, Frank Foundries Corp., Moline, Ill.; John Hartman, Atlas Foundry & Machinery Co., Tacoma, Wash.; W. L. Hinds, Crouse-Hinds Co., Syracuse; B. H. Johnson, Cresson-Morris Co., Philadelphia; Chas. R. Law, De Soto Foundry & Machine Co., Mansfield, La.; Don McDaniel, Hamilton Foundry & Machine Co., Hamilton, Ohio; Walter L. Seelbach, Forest City-Walworth Run Foundries Co., Cleveland; Edward B. Sherwin, Chicago Hardware Foundry Co., North Chicago. A. E. Clarke, Des Plaines Foundry Co., Des Plaines, Ill., and Angus McDonald, Snead & Co., Jersey City, N. J., were named as alternates to this committee.

It was suggested that plans be made to hold a call meeting of gray iron foundrymen during the week of the American Foundrymen's association convention in Philadelphia, May 14-18, at which time the organization committee was instructed to present detailed plans for the form and purposes of the gray iron institute.

Should Advertise Gray Iron Merits

By Walter L. Seelbach

NO ONE can say that the production facilities for the manufacture of gray iron castings have not increased perceptibly since 1914. Since that time foundries have been doubled and trebled in capacity. Many large users of castings have found their purchases doubling and trebling. Some of these users have felt that it would be better for them, from the point of service, and also from the point of view of price, to own their foundries and produce their own castings. The result has been that many users of castings have built foundry additions to their plants. Sometime since the war, many found their business also had slumped. They discovered they had no need for a part of their large foundry capacity. They found it necessary to keep these foundry departments operating to at least keep the overhead down, if not to break even. There was not sufficient work of their own to accomplish this, so they have been entering into competition with us as jobbers of castings.

Many users of castings, particularly in the automobile industry where the business has grown by leaps and bounds and continues to grow, also added foundry departments. This did not help the situation.

Hand-to-mouth buying has been prevalent for about three years. Years ago purchasers of castings would order ahead of their needs. Contracts were made with the foundryman for from three to six months' supply of castings. What do we find today? The foundrymen usually do not have 30 days' business ahead. In fact, half of them do not have sufficient orders on their books to keep the foundry going over two weeks. What is being done in an intensive way to overcome this condition? I

have seen the foundrymen sit complacently, month after month and year after year, hoping for conditions to change, so that a sellers' market may take the place of the buyers' market which has prevailed during the past 3 years. If the buyers' market does become a sellers' market, hand-to-mouth buying will cease.

Will industry in general stop hand-to-mouth buying? I am not so certain that such action will be taken. Much is going on in various lines which indicates to me that industry in general plans to do business in the new way. Producers do not have to carry the big inventories when this method of buying is followed. Stocks of raw materials on hand are smaller. Deliveries of both raw materials and finished products are speedier. Other factors of a like nature have caused business men in many lines of endeavor to feel that hand-to-mouth buying is not such a bad thing. In fact, many of these business men and manufacturers in other industries are adjusting themselves to the new order of things.

Has Some Advantages

Many business men feel that hand-to-mouth buying is a good thing and has come to stay. New methods of retail merchandising such as the chain store, have encouraged hand-to-mouth buying. Foundrymen should endeavor to determine whether the policy of hand-to-mouth buying will continue for a indefinite time.

Not only have we over-production facilities, hand-to-mouth buying and competition from users of castings who have added foundry departments and who are now competing with us in an endeavor to keep those departments going but we have found that numerous competitive industries are making inroads on the gray iron market. What are we doing to offset this competition from other industries? Nothing. Of course, some individual foundries are making a more strenuous effort to secure business. Perhaps the head of the foundry is doing more traveling today than ever before, trying to obtain business. However, what concerted effort and intensive study are gray iron foundrymen, as a group, making to combat these things which are greatly affecting the gray iron foundry business?

So far, only one thing has been done toward finding a solution for these problems. The assistance of the department of commerce has been secured to collect statistical information on present and past production and capacity of the gray iron foundries. The data on the questionnaire, sent out by the department, now are being compiled.

Sees Organization Need

After the department of commerce had started its work the next step seemed to be a meeting of a group of gray iron foundry executives, such as this, to discuss the entire situation. However, it was felt that prior to such a meeting, as many foundrymen as possible should be interviewed and their ideas crystalized. It was considered necessary that proper publicity be given the subject so that when this meeting was called the best ideas of the leading gray iron foundrymen in the country would be available. The meeting of such a group as this can mean only one of two things: namely the adjournment of the meeting with the thought that nothing can be done collectively, or the belief that collectively something can be done to relieve the present situation. If it is the former, then undoubtedly we will go on as we have in the past. If the latter is the concensus of opinion, we must band together and solve the problems.

In banding together to help the cause of the gray iron foundry industry, the following objectives should be considered. These objectives are not necessarily in order of their importance:

Research. The matter of improving our product and increasing its utility to the industry is essential. It is thought much can be done along this line in co-operation with existing associations and research organizations.

Merchandising. The term *merchandising* seemingly is new to the average gray iron foundryman. He thinks it is something beyond his ken, yet it is something that practically every other industry has been working on since the war. What a field this subject opens up! I am not going to try and cover it in its entirety, as it is worthy of a full day's discussion in itself. However, permit me to mention a few points:

Present markets would be strengthened by having foundry executives set up standards for casting production and standards for service, such as uniform trade customs. Markets would be strengthened by having standard cost records available so that prices would be more uniform and that ignorant and unsound competition would be reduced to a minimum. The spreading of information about substitute metals, which have replaced gray iron and have been found lacking, would be of benefit. That information should be available to foundry executives who may have customers contemplating such substitutions. Stabilizing and strengthening of the present market would do much to prevent substitute metals from making further inroads.

New markets should be developed by acquainting the industry with the many advantages of gray iron. A search should be made for products which are not being made in gray iron at present, but which could be made of that metal economically. The improvement that is made in the product must be broadcast to industry in general so that the new markets will be opened for gray iron castings. Unprofitable foundries should be liquidated and the space turned toward other channels.

New Markets Necessary

Foundries should be consolidated and strengthened where it is found advisable.

If a manufacturer contemplates the removal of his casting production from his present foundry source and expects to build his own foundry for the manufacturing of the castings, a gray iron association could be of much value to the industry. Such an organization would present facts and costs to the manufacturer to prove the fallacy of such a move. The group also could show the buyer of castings that improved conditions in the gray iron industry increased the ability of the foundrymen to serve.

The other side of the question also should be considered. If a manufacturer is running a foundry for the production of his own castings it might be possible for the gray iron group to show him that it would be more economical to have his castings made by an outside foundry.

The following is an extract from an article by C. L. Patterson of the Sheet Steel Trade Extension committee, an organization functioning in the sheet steel industry, just as the group should function in the gray iron industry.

"During the world war mills scarcely could turn out enough steel sheets to meet demand. Production capacity was greatly increased, doubled, and in some cases trebled. Selling problems did not bother the management of these corporations in those days. But when the deflation set in, the steel makers found themselves with huge factories and only a normal demand. With a buyers' market, selling became primary. Lowered production or cut prices or both situations, would have been the result.

"Something had to be done. A Chicago advertising man suggested a plan of co-operation, a trade organization that would help to stabilize the industry; that would help to find new markets; that would aid in expanding present markets. For example, it was found that 30 per cent of the sheet steel made was going to automotive factories. Too many eggs in one basket. As for volume, this was not a bad situation, but the proportion was too high. A greater proportion of output should be going into other channels, even though the volume taken by the automotive industry should be high and increased if possible. Certainly, many other fields offered opportunity for the use of sheet steel in large volume.

"The result of many conferences among manufacturers led to the organization of the Sheet Steel Trade Extension committee in 1924, with C. L. Patterson, executive secretary and with Pittsburgh as headquarters.

"The function of this bureau is twofold:

"To co-operate with manufacturers and fabricators in finding new products which could be made from sheet steel; to find ways to improve the utility and salability of products already being made from sheet steel, and to uncover new uses and new markets for all such products.

"To increase consumer use of sheet steel products through educational publicity, through tests to prove the utility of such products to engineers, contractors and ultimate users, and through co-operation with the sales promotion departments of manufacturers.

"Besides accomplishing much in minimizing the evils of price-cutting and in improving the quality of many products in the industry the Sheet Steel Trade Extension committee, as indicated, has had much to do with the increased sales registered throughout the industry.

"Only an example of two can be given to suggest what is being done to push the number of different products well beyond the 5000 mark. A plant which had been manufacturing many automobile bodies in past years discovered its production dropping because the big automobile makers were turning out their own bodies. This firm has special presses and finishing machinery and, of course, desired to utilize this equipment. Engineers of the Sheet Steel Trade Extension committee suggested to this manufacturer that he make standardized radiator covers for homes and offices. Thirty-seven manufacturers already were producing radiator covers, but because of the variety of sizes and shapes of radiators, these firms were making covers to order. That meant high prices and restricted sales. Why not standardize on covers to fit the usual size of radiators and plan for volume production? The manufacturer of bodies accepted the suggestion. This company now is making radiator covers in more than 100 sizes, is selling its products in the drapery department of big stores throughout the country, and is behind on orders in its production departments.

"A few months ago a western manufacturer began making sheet steel wall tile to be attached to fireproof wall board, with nonshrinkable cement. Three years ago the Sheet Steel Trade Extension committee had discussed the possibilities of this market in a prophetic manner.

"All the basement laundry trays formerly were made of slate, zinc or lead because sheet steel manufacturers found that the 'deep drawing' necessary to form such tubs out of one single sheet and without any seams would result in breaks. But now sheet steel is being made that will withstand the 'deep drawing', with the result that spotlessly white porcelain enameled laundry trays made from sheet steel are being sold by the thousands."

Need Advertising

Advertising and publicity are two subjects closely related to the merchandising problem. Of course some action should be taken to counteract the present drive on gray iron products by the other metal industries. Gray iron as it is today has many advantages that are not known to the average manufacturer whose finished product would be strengthened by the use of gray iron castings. Manufacturers, who contemplate bringing out new finished products in which gray iron could be used, should be considered. If sufficient publicity could be given to the advantages of gray iron as it is today, and additional publicity when our research has developed gray iron to a higher point of efficiency, we should be able to placate some of the metals that are making inroads on our industry. Standardizing of manufacture, cost systems, etc. avail us nothing if the proper advertising and publicity is not undertaken to acquaint the general users of gray iron castings with the progress of the industry.

Here is just one example of an important field that has not been entered. What knowledge of gray iron has our present engineering college undergraduate? Those of us who have gone through engineering schools, and those who have followed these lines as they are taught today, find that students are getting only the basic fundamentals on gray iron. At the same time other metals are being emphasized far greater. We know that the engineering students of today will make the decisions tomorrow.

In former years, the average foundry executive was so well acquainted with his customers that he was taken into confidence on any contemplated changes in the design or in the material used in their product. We find today, especially in the larger organizations, that the changes in design or materials used are made behind closed doors by men whom the foundry executive does not get to see or know. After these gentlemen have made their decision on any contemplated change it seldom is possible to alter the decision. The gray iron group therefore must reach these gentlemen through other channels and publicity in its various forms may be one means.

When one thinks of the many possibilities, and fields that advertising and publicity would open, it is imperative to start at once. As an answer to those who believe that advertising of raw material would not pay, let me read an extract from the recent article called "Worth Your Money" by Roger W. Babson, in the Jan. 28 issue of *Collier's*.

"At all times advertising is IMPORTANT: but during an era of weak prices it is IMPERATIVE. Nearly ten years have now elapsed since the peak of the postwar boom. During this period the broad trend of general commodity prices has been declining or weak—as was foretold by the experience of other wars. In a remarkable way this had divided all companies into money-makers and money-losers. Ten years of price weakness have brought SUCCESS to the advertisers selling MANUFACTURED GOODS; but FAILURE to non-advertisers selling RAW materials. Electrical equipment has done well; copper has done badly. The automobile has been extremely successful; steel less so.

"To summarize the record for a few leading groups:

"Some lines which have risen above average in prosperity; Automobiles, most automobile accessories, electrical equipment, certain food products.

"Some lines which have fallen below average in depression: Copper, steel, most other metals, coal, oil, sugar, cloth, certain machinery, leather.

"This lesson is unmistakable: The

national advertisers are making the money."

I have tried to call to your attention the following problems confronting our industry:

Hand-to-mouth buying.

Overproduction facilities.

Competition from other industries which is making such strong inroads in our business.

Production costs.

Merchandising through the strength of present markets and opening of new markets.

Encouraging the liquidation of the unprofitable foundry and this space turned into other channels.

Encouraging the consolidation and merging of foundries.

Discouraging the increasing of the foundry capacity of the country.

Encouraging wherever possible the abandonment of foundry departments by manufacturers.

Publicity in its many ramifications.

I realize that already there are in existence, various agencies and organizations which cope with many of the intricate problems confronting foundrymen generally. These organizations study such subjects as labor, foundry practice, technical matters, design of new foundries and many other features. However, these agencies are not equipped to cope with the problems which have been enumerated. Also, these agencies have within their fold and cater to all branches of the foundry business, whereas the problems which have been called to your attention affect particularly foundries exclusively engaged in the production of gray iron. There is no organization or agency in existence that could effectively take up these matters. Those engaged in the steel foundry business have their own exclusive organization, as has the malleable producers and the brass manufacturers. Therefore, it is in order, in view of all that has been said, that those engaged in the gray iron foundry business consider the organization of a group which might be termed the American Gray Iron institute, to consider exclusively the problems confronting gray iron foundrymen, with the hope that in due course of time some things may be accomplished toward the end that we may again enjoy the profitable business realized in years gone by.

Will Present Papers at Barcelona

SEVERAL foundry technical associations are presenting exchange papers at the foundry convention which will be held in Barcelona, Spain, April 10 to 14, and the Italian government has asked Carlo Vanzetti, managing director, Fonderia Milanese Acciaio, to organize an Italian delegation. The following papers will be presented at the conference:

American exchange paper, presented by the American Foundrymen's Association: "Gray Iron Development and Practice," by Dr. Richard Moldenke; Belgian exchange paper, presented by the Association Technique de Fonderie de Belgique: "Foundry Sands—Study of a New Method of Testing," by Gustave Masson, past president of the Belgian foundry association, and Honoré Compè, chemical engineer; British exchange paper, presented by the Institute of British Foundrymen: "Nickel in Cast Iron," by Dr. Everest, University of Birmingham; Czech exchange paper, presented by the founry technical association of Czecho-Slovakia: "Microscopic Study of the Influence of Phosphorous on the Structure of Cast Iron After Heat Treatment," by Richard Bazan, engineer; French exchange paper, presented by the Association Technique de Fonderie de Paris: "The Necessity of Improving Our Methods to Reduce Production Costs," by Léon Thomas, president of the French foundry association.

Exchange papers also will be presented by the German foundry associations and the Dutch foundry association, and the subjects will be published later. Among other papers will be: "Improvement in the Methods of Reutilization of Steel Scrap in Foundries," by M. Lely, engineer, Ecoles Nationales des Arts et Metiers; "Contribution to the Study of Technical Terminology in the Foundry," by J. M. Espana, vice president of the French foundry association; "Study of Cost in the Manufacture of Pig Iron," by Jaime Coll, Fonderie de San Antonio, Seville.

Papers also will be presented by Prof. Portevin; I. Sans Darnis, foundry manager, Viscaya Iron and Steel works; J Ferrer, manager of laboratories, Engineering and Foundry works, Del Ebro; A. Lafont, works manager, National Manufacture of Arms, Toledo, etc.

A Partial View of Barcelona, Spain, and the Tibidabo where the Congreso Internacional de Fundicio or International Congress of Foundrymen Will Be Held from April 10 to 14. Following the Convention a Tour Has Been Arranged Which Will Include Visits to Valencia, Seville, Madrid, Toledo, Bilboa, Eibar, San Sebastian and Beasain

Vacuum Principle
IS APPLIED TO
Permanent Mold Casting

By Edwin Bremer

AT VARIOUS times the vacuum process has been suggested as an ideal method to obtain solid castings, free from gases, blow holes and other ills. However, it is only recently that this process has been developed commercially and applied to the quantity production of lead, storage-battery grids.

This process, strangely enough, was suggested by methods used in working a material that is unlike metal in its properties. Practices in molding and forming glass, formed the basis of this development. A short description will show how glassmaking closely approximates the methods in vogue in the foundry. Materials used for making glass are melted in a refractory pot that may be compared to the crucible, since each batch of molten material is removed from the pot before the materials for the next batch are admitted.

Glass is made from a mixture of 75 per cent silica sand and small quantities of other materials such as soda ash, and 25 per cent broken glass. These may be compared to the ingot, alloys, and scrap that compose the charge for a crucible of metal. However, after the ingredients have melted or fused together, the molten mass is not fluid like metal but is thick and viscous. Handling molten glass is different from handling molten metal, except possibly in the making of plate glass. This may be compared to rolling steel as the viscous, molten glass is poured on a horizontal, level, cast-iron plate and then rolled while still hot, to the required thickness.

Make Bottles By Hand

In making bottles by hand, the glassblower thrusts a hollow tube into the molten mass, gives it a twirl to collect a certain amount of the glass on the end. The glassblower then puts the end of the tube with the glass on it into an iron mold and at the same time blows into the opposite end of the tube. The pneumatic pressure forces the glass to all parts of the mold. The mold then is opened and the formed bottle removed to the lehr or annealing oven, where it slowly is cooled.

At the present time the great majority of bottles are made by machines which perform automatically the same work as the glassblower. In the bottle machine, a hollow tube dips into the molten mass and through a vacuum picks up the proper amount of glass for one bottle. As in the case of the hand work, the end of this tube with its glass is thrust into the mold and air pressure forces the soft glass to the walls of the mold. However, as stated previously, all the actions are automatic from reaching into the molten material, opening the vacuum line, swinging to the mold, placing it in the mold, reversing the valve to admit air pressure, opening the mold and removing the formed bottle to the lehr.

A machine similar in principle recently was developed to produce millions of electric light globes. The inventor of this machine was August Kadow,

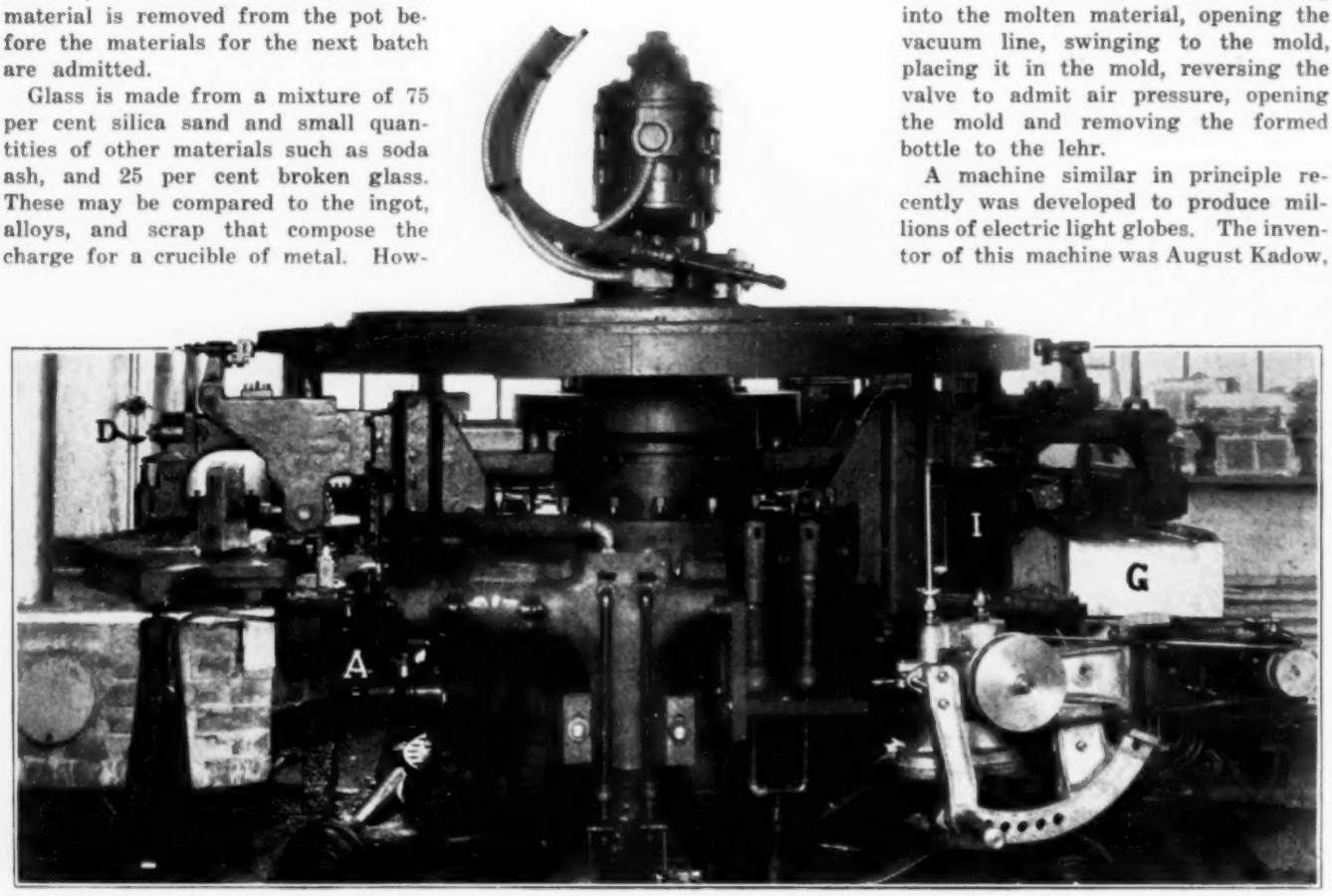


Fig. 1—Side View of the Machine Showing a Mold Immersed in the Molten Metal on the Left and a Mold Being Cooled on the Right

at present chief engineer, Owens Bottle Co., and vice president, Vacuum Castings Co., both of Toledo, O., and although not a metallurgist or a foundryman, he conceived the idea that a similar process might be applied to the production of castings. However, he early discovered that a great many difficulties had to be overcome. His first experiments were performed with a piece of pipe 16 feet long and the metal was molten lead. Mr. Kadow found that by using a vacuum, he could fill the pipe held vertically with the molten metal. In fact it worked too well, as the molten metal was raised beyond the confines of the pipe. After some experimenting he found that by controlling the amount of vacuum, that is by increasing or decreasing it, the molten metal could be raised to fill the pipe completely or to any point between the upper and lower ends.

Hold Back the Metal

This solved one difficulty, but another serious one remained. This was retaining the metal in the pipe. After trying and discarding many ideas it was discovered that a constricted opening at the end of the pipe dipping into the metal bath would restrain the backflow of the metal sufficiently to allow it to solidify. Although these two factors were important, numerous other difficulties were encountered and overcome, such as the correct temperature of metal, proper mold temperature, etc.

Then a machine was devised to employ the vacuum principle, and to perform all the operations automatically. These operations consist essentially of opening the vacuum line, dipping the ingress or gate end of the mold into the molten metal, allowing the proper time for solidification, opening the mold and ejecting the finished casting, cooling the mold, smoking the joints to make a proper seal for the vacuum, brushing out any loose particles of soot, and closing and clamping the mold for the next dip.

Eventually, these operations were perfected, and the completed machine is shown in Fig. 1. Only two of the twelve mold-carrying arms are shown in this view and only one arm in Fig. 2. Also, at present a conveyor belt has been attached to the machine at the ejection point, shown on the right in Fig. 2. The machine is 10 feet 3 inches in diameter and weighs between 10½ and 11 tons. The pillar carrying the arms which move in a circular path, is rotated by a 3-horsepower electric motor. This motor may be seen in Figs. 1 and 2 and is mounted vertically.

Control Movements

Motions of the various parts of the machine such as dipping the mold in the metal bath, opening the vacuum line, etc., are controlled by combination roller and cam actions. In Fig. 1, the gate end of the mold is immersed in the molten metal. This action is controlled by a roller which may be seen at *A* on the lower part of the machine. This roller moves between two guides which are plainly shown at *B* on the lower part of the central cylinder in Fig. 2. At various points these guides have dips, as may be seen in the illustration. As the roller follows the dip, it lowers the arm and this in turn lowers the mold into the metal as shown in Fig. 1.

Just before the mold is immersed in the metal, the vacuum line is opened by the roller operated from the cam. This device is shown in the upper left of the machine at *C* in Fig. 1. As the roller strikes the cam it is forced out and this motion is transmitted by a system of levers to the

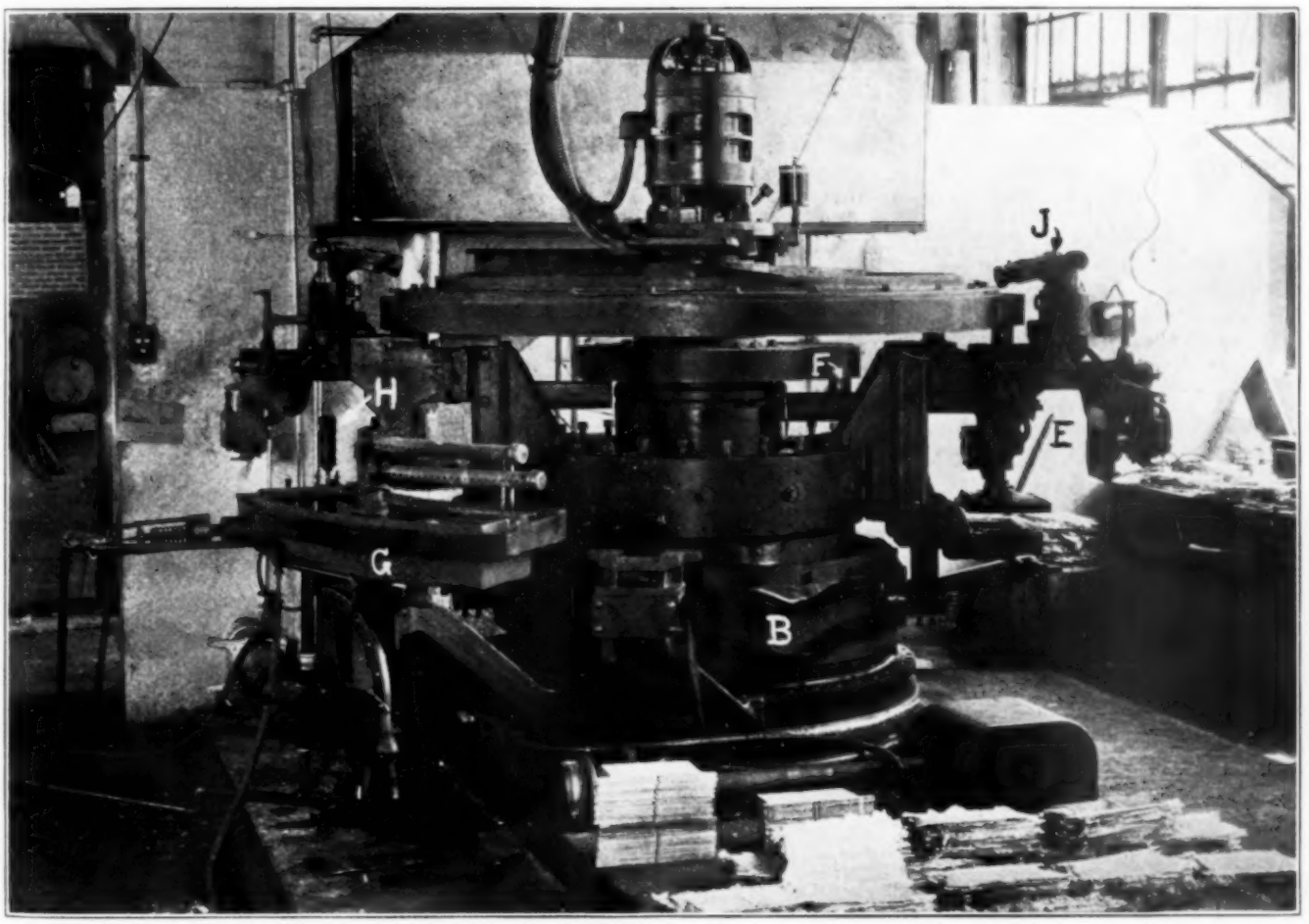


Fig. 2—The Water Cooling Bath, Thermostatically Controlled, Is on the Left and a Mold Ejecting a Finished Casting Is Shown on the Right

spring controlled valve which opens the vacuum line. Just above the spring valve at *D* may be noticed a small cylindrical drum with a knurled nut at the end. This device is a valve for adjusting the amount of vacuum. This valve contains a slotted opening graduated from 1/8-inch to 1/16-inch. The position of the slot determines the width of opening and consequently the amount of vacuum; the narrow opening decreasing the vacuum and the wider opening increasing it.

The brickwork chamber shown at the left of Fig. 1 is the heating chamber for the iron pot containing the molten metal. The temperature of the metal bath is maintained at an even level through thermostatic control. Another furnace, not shown in the illustrations, is used as a reservoir. In this furnace the metal is kept just molten, and through a system of floats and levers, metal from the reservoir furnace is admitted to the bath at the machine when the level falls below a predetermined point.

Molds Swings Down

On the right at *E* in Fig. 1, the mold is shown open just after ejecting a casting. A number of the castings which are lead, storage-battery grids, are shown in the foreground. The opening of the mold is controlled by the roller eccentric *F* which may be seen just behind the heavy vertical support of the arm. As the arm reaches this point in its rotation, the eccentric forces a rod in the arm proper forward. The opposite end of this rod contains rack teeth which engage a pinion attached to the inside half of the mold.

As the rod and its rack teeth move forward, the mold half opens and swings downward into the position shown in Fig. 2. A small projection at some unimportant place on the mold face causes the finished casting to stick to that half of the mold as it is opened. However, when the mold face is horizontal the projection does not exert any holding power and the casting drops down. After the casting is ejected, the eccentric action brings the two mold faces vertical but not together. In this position the two halves of the mold pass through the cooling bath which contains water and is shown at points *G* on the left in Fig. 1 and on the right in Fig. 2. Fig. 2 also shows the mold passing through the cooling bath. The temperature of the cooling bath is controlled thermostatically by the device which may be observed attached at the left of the water bath chamber in Fig. 1. The water bath chamber may be raised or lowered to immerse the mold at varying depths.

Speed of movement of the mold through the cooling bath and the temperature of the water bath regulate the mold temperature. After the mold passes through the bath, a small projection on the side of the mold opens the valve to the smoking burner *H* in Fig. 1. This burner uses gas which is incompletely consumed. This produces a heavy, yellow flame containing many unconsumed carbon particles which are deposited on the mold faces that pass on either side of the burner. Excess soot or carbon is removed by the vertically revolving brush which may be observed in Fig. 1 on the right at *I*.

After brushing, the eccentric arm action closes the mold and a roller and lever action operates the toggle device which clamps the two halves of the mold together. The roller and lever system and the toggle device may be observed at *J* at the upper right in Fig. 2. As may be noted, the clamping device has the appearance of a large open-end wrench. The jaws have a slight taper and when the mold is closed, the device is forced vertically down over two roller pins, one on each half of the mold. The taper of the jaws forces the two parts of the mold tightly together. Then the mold is ready to be dipped into the molten metal and to begin another cycle.

Regulates Mold Temperature

Figs. 3, 4, 5 and 6 show some of the castings which may be produced by the machine. Fig. 3 is a tube of white metal 1-inch in diameter, 4 inches long, and the walls are 1/100-inch thick. The seam made by the mold may be noticed at the top of the tube. Figs. 4 and 6 are lead, storage-battery grids. These grids are about 5 x 5½ inches and as may be noted in the illustrations, contain numerous vertical and horizontal bars. These bars taper from front to back from 1/64 to 1/16-inch, and it will be observed that these bars are run full and sharply cut. Fig. 5 illustrates the method of vacuum control. In

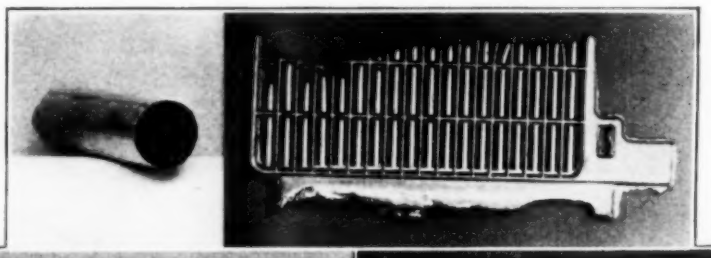
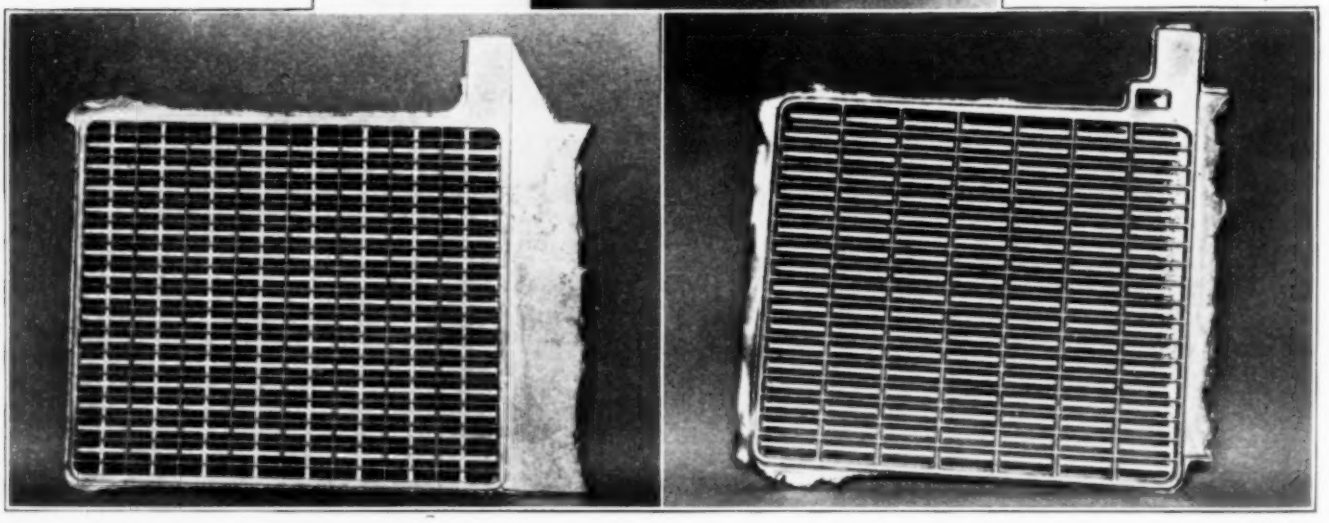


Fig. 3—Right—Small Tubular Castings May Be Made by this Process. Fig. 4—Below—One Type of Lead Storage-Battery Grid

Fig. 5—Left—By Decreasing the Vacuum, the Mold Only Partially Was Filled. Fig. 6—Below—Another Type of Lead Battery Grid



making this casting, the vacuum was decreased considerably which caused the mold to run short.

The machine can produce 3000 battery grids of the type shown in the illustration in an hour if a single mold is used. With a double mold twice as many or 6000 castings can be produced in the same length of time. This, of course, refers to the machine having its twelve arms in operation, and calculation will show that a casting either single or double is produced every 1 1/5 seconds.

At the present time the Vacuum Castings Co., Toledo, O., which manufactures the machines, is designing a smaller machine which will only have two arms, instead of twelve as in the larger. It is expected that the smaller machine will be applicable to plants where smaller production will fill the needs. The firm also is developing a machine which combines the vacuum process and a pressure to densen the casting. This machine fills the mold by the vacuum principle and then a pressure of 200 tons is applied. At present white metal bushings are being produced by this process and the fractured surface of one of the bushings examined showed a tough, solid, finely grained structure.

Although the present developments have been primarily with white metals, castings have been produced from other alloys such as aluminum. Later the firm expects to carry on investigations with other nonferrous metals and alloys and gray iron, to determine the controlling and limiting factors. When these characteristics have been determined, machines will be developed to employ the vacuum principle in producing other types of castings.

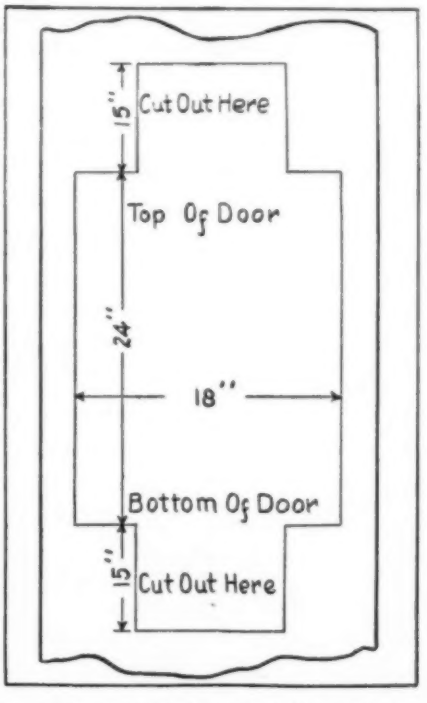
Melts Large Shaft in Cupola

By James H. Anderson

OFTENTIMES a foundryman is called upon to melt up large pieces of iron in his cupola. Sometimes doubt is expressed that the cupola can melt entirely a huge piece of scrap, but there is no need for worry because if it can be put into the cupola it can be melted if a little care is observed. A good many years ago the author had some experiences along this line, and believes that descriptions of the methods used may be of interest to other foundrymen.

At one time he was associated with a new foundry at Atlanta, Ga., which had been built on the site of an old grist mill that had been run with water power. The old cast-iron gudgeon shaft that connected the wheel and mill was lying in the yard and had been for seven months as it was so large that no method had been devised to get rid of it. This shaft was octagon in shape, 8 inches from face to face at the large end and about 5 inches across at the small end, and was 22 feet long.

One day the firm decided to replace a steel smokestack by a larger one, and in erecting this stack a derrick was used. The author noticed that the derrick boom swung over the foundry roof, and conceived the idea of using it to hoist the gudgeon shaft and lower it into the cupola. After putting in three charges, of one ton each, the gudgeon shaft was lowered and the remaining charges were placed around it. The heat consisted of 27 tons and we expected to see at least one-third of the gudgeon come down in the drop, but it melted entirely. No difficulty was experienced in obtaining good hot iron for the woodworking machinery castings which were being poured and which required hot metal from the spout.



ADD MELTS LARGE SHAFT IN CUPOLA A SLOT CUT ABOVE AND BELOW THE CHARGING DOOR PERMITTED THE CARWHEELS TO BE ROLLED INTO THE CUPOLA

Several years later in 1906, the author accepted a position as foundry superintendent with a firm in southwestern Ohio and in going over the quite extensive scrap yard of the foundry, came across several carloads of scrap carwheels. The wheels were too large to be charged in the cupola as the door was only 18 inches wide and 24 inches high, and as the firm did not possess a drop for breaking scrap, the wheels were allowed to lay in the yard. This scene called to mind the melting of the gudgeon, but there was no derrick to reach to the top of the cupola. However, the following Sunday the author conceived the idea of cutting a vertical slot extending above and below the existing door, large enough to admit the wheels.

This was done at once as shown in the accompanying sketch. The charges weighed one ton each and a carwheel was placed on the third charge and every charge thereafter. The castings made ranged from ¼-pound in weight to 3 tons, and the light work was poured along with the heavy. Consequently the iron had to be hot to prevent misruns. Castings made included those for sugar mill machinery and some specification jobbing work. However, no difficulty was encountered in turning out good castings, and no more coke was used than for the regular run of charges. Several weeks after the wheels all were melted, the door of the cupola was enlarged to the height of the slot and a width of 3 feet, making the opening 3 feet by 4 feet 6 inches.

Resigns Vice Presidency

T. A. Arthur has resigned as vice president of the Hickman, Williams & Co. Inc., Pittsburgh. In 1907 Mr. Arthur was with Sam Cooper and Carl Banning, represented Naylor & Co. at Pittsburgh. He continued in that capacity after Banning, Cooper & Co. was formed in 1899. In 1907 he became affiliated with T. Coleman Ward as salesman, Mr. Ward being resident manager of the Hickman, Williams Co., in charge of the Pittsburgh office. In 1913 when the company was incorporated, Mr. Arthur became a partner. In 1918 he was elected vice president.

Removing the Hazards from

Piece Price Quoting

Small Errors in Weight Estimating Often Mount to Staggering Losses When Responsibility Is Not Clearly Defined

By O. C. Gilbert
(Consulting Engineer, Chicago)

Part I

ADVANTAGES of piece-price quoting in the steel casting industry are too well understood to require re-stating. The question is not, "Shall we operate upon a piece-price quoting basis?", but rather "How may we safely adopt the piece-price basis for quotation purposes?"

In those foundries now using the piece-price quoting method the question becomes "Where is piece-price quoting leading us?" "What are the real facts concerning our operations under this system?"

The purpose of this series of articles is to lay down the general rules necessary to the safe use of piece-price quoting in the steel casting industry and to point out how these rules may be adopted in specific cases to the end that the dangers accompanying the use of the system may be avoided or reduced to a negligible point.

Piece-price quoting upon steel castings implies that the foundry is able to state in advance what castings will weigh when a pattern is not yet made. It further implies that the foundry is ready to back up its estimate with a production contract for perhaps as high as forty thousand castings weighing perhaps 600 pounds each. Or perhaps it may be for a dozen castings weighing 14,000 pounds each.

These, it might be argued are exceptional instances. Perhaps it may be said that most contracts even in the railroad specialty field do not involve so much, but when it is considered that a single estimate may continue as the basis of shipments for ten or fifteen years and involve perhaps a dozen issues of the same pattern used for different customers, the total amount hazarded in the original quotation may be considerable.

For instance, a single mistake of this type running over a period of years in one case cost a steel company $24,000 and the end is not yet in sight.

When a foundry goes upon the piece-price quoting basis it quickly becomes necessary to extend the practice to a larger part of the production than is likely to be contemplated at the inception of the practice, since the aid to the salesmen in the field that this practice lends is quickly appreciated in competitive selling and the demand from the sales department for quoting weights becomes insistent.

Thus, what may start as a price quoting practice intended to apply to large competitive business where the engineering department thoroughly re-figures and re-checks the quoting weights, soon involves quotations upon smaller inquiries where the interest of the engineering department subsides. A means of shifting the burden of the relatively easy but exacting task of figuring the quoting weights is sought and generally found by loading the work upon the drafting room.

Faith Is Builded

In time as no mistakes appear a naive faith in the estimated quoting weights upon which perhaps millions of dollars of business is based lays hold of the organization and the directors congratulate themselves upon the astuteness of their engineering force. About this time something happens. A side frame fails in service and investigation shows that the weight estimate which the pattern shop had been obliged to make the pattern meet was 50 pounds light.

The trusting faith in the quoting weights is now supplanted by a season of doubts when the management shouts,

"Eureka, we have found it."

"All quoting weights shall henceforth be checked! Indeed we shall go farther. We shall make two separate and entirely independent estimates of every design and they must coincide before the estimate may be used."

It then develops that the estimates frequently are quite far apart and the device of then making a third estimate is tried as a means of indicating which of the two estimates is correct. This not infrequently supplies a third weight at variance with each of the first two weights.

In time as this method does not work out, due to the ease with which errors of multiplication or addition or decimal errors can creep into an estimate involving hundreds of separate calculations and because of the difficulty of finding them particularly on the part of the man who made the estimate a new method is tried. In this new estimating procedure one estimator makes the layout and the estimate and it is checked by another man. The procedure is adopted as being more accurate or at least less productive of doubts and qualms.

Then just as everything begins to look rosy something else happens again to cast doubt upon the *foolproofness* of the procedure.

Perhaps a competitor walks off with a large contract with a weight quotation 60 pounds less upon an identical design. The estimate is investigated and found to be 55 pounds too heavy due to a decimal error passed by the checker.

It is then decided that the drafting room is not the proper place anyway to do this work and a new department

is installed with two engineers acting as weight estimators. They work together, one doing half the work which the other checks and vice versa.

It is decided at last after a review of the experience in piece-price quoting that some mistakes will occur. Discovery is made that the loss from these mistakes will more than be offset by the advantages to the sales department in being able to quote actual price against competitors pound price or delayed piece-price made only after temporary patterns have been fashioned for quoting purposes.

The piece-price quoting practice now is in full swing and it is only after years of actual operation that a survey of the results can show the tendencies of the method.

The view of the management is likely to be about as follows—We have several checks upon our quotations at least in many instances. Where the quotation is upon a change in pattern we already are running, we calculate the difference in weight and as this generally is a small part of the total weight involved there is not much chance for error. Or where the quotation is upon a pattern that is to be made from another customers pattern with a change of pattern issue to give the new customers pattern number and small changes, we already know the weight of the base and are hazarding only the small difference. In the case of a new design, not tied in with an existing design, for which we have a pattern we have an opportunity to catch quoting weight errors through the failure of the test casting in static test. By compelling the foundry to meet the estimated weight before shipping castings, we eliminate the possibility of loss in shipping metal not paid for by the customer.

However, in all these suppositions the management that thus reasons may err in their supposition for in the conduct and management of a piece-price foundry there is a large number of secondary errors that creep in unnoticed. These in the aggregate, if no precedure is adopted to avoid them, can mount to astonishingly large figures on the red side of the balance sheet although their presence is invisible to the management, as will be shown.

That Reducing Diet

Let us take an actual example. An estimate is made and checked and the customer is quoted upon the basis of the estimate. The foundry has the pattern made and reports that they cannot bring it to the estimated weight. The estimate is 871 pounds per casting. The foundry finds that the casting weighed 905 pounds as originally made and they have brought the weight down to 880 pounds but cannot skin the pattern further without changing dimensions so much that they suspect an estimating error.

The estimating department has the original estimate checked and finds it o.k. They suspect an error difficult to locate and re-estimate the entire job, even making a new lay-out. The new weight is now 873 pounds within two pounds of the original estimate.

The foundry is told that the weight as originally submitted was correct and a heated argument ensues both the office and the foundry insisting that the other is in error. The office, having the authority, commands the foundry to meet the estimated weight which is done and the castings are shipped at or near the estimated weight. Later a change is made in this same pattern and the change happens to be of such a nature that it becomes easier for the estimating department to re-estimate the weight rather than make the weight estimate by difference from the old pattern.

Right Back Again

The new weight goes to the foundry at 902 pounds. The office is advised by the foundry that the difference in the old pattern and the new is a matter of only a few pounds and requests an explanation of the large change in weight submitted. It now is found that the blue print used for the original weight estimate differed from the one used by the foundry. It is found that a radical change was made in the original design, but the estimating department, working from an unchecked drawing, had not been notified of the change. Thus, the faith of the foundry in the weights submitted is shaken and, thereafter, when a test casting runs over or under weight the foundry is tempted to fatten the pattern or skin it down as the case may be believing this method the easiest way to get along with the office.

Thus the practice of always meeting the estimated weight is adopted and once implanted it is hard to shake off.

It is because of these secondary errors or adaptations on the part of individuals and departments to conditions arising out of quoting weight errors that cause the losses to foundries using the piece-price system. These secondary errors have as their source almost innumerable occasions that have not as yet fully been taken into account in the application of the system.

In the following discussions the sources of some of these errors will be illustrated by actual instances that have occurred. Laws governing the safe use of the piece-price quoting system will be laid down and the method with its checks will be illustrated.

A side frame design is submitted for estimate and quotation and the weight estimate being completed and checked, the sales department quotes a piece-price. The order is secured. The foundry completes the pattern and makes test castings. The weight to which the foundry is working is 450 pounds. The first test casting weighs 550 pounds. After skinning down the pattern to 60 pounds under this weight, the foundry gives up and reports that they are unable to meet the quoted weight.

A new estimate is made and it is found that an error of one hundred pounds was made in the original estimate. Result: The foundry loses faith in the quoted weights and the office has proof that the foundry will depart from drawing dimensions to the extent of 60 pounds in 550 pounds. This would indicate that a mistake of 50 pounds could go through the foundry without protest. Such a mistake in the railway specialty field could affect ten or even twenty thousand castings and cause a loss of a million pounds of steel in a single pattern.

Another example of secondary errors arising out of the inescapable human equation enters into the situation arising where erroneous quoting weights have been established upon incorrect weight estimates.

The estimating department is behind in the work. A rush request for a quoting weight comes in where the design of bolster or side frame, or what not, does not vary materially from the pattern base now in production.

Draftsman Makes Estimates

The drafting room has completed the change in design, perhaps the removal of a design of lightening hole in the top or bottom of a bolster and the substitution of the new design of lightening hole. What is more natural than to have the draftsman who made the drawing changes calculate the weight changes involved. The customer is quoted and the files are entered with the new weight.

This works so well that the procedure is repeated and soon all small changes are estimated by the draftsman doing the work which involves weight change. In time perhaps half of the weight estimates are done in this way.

After a few years of this pro-

cedure it is discovered that a design figured in this way was incorrect in weight, that the lightening hole had been added where the metal was in fact removed. Further it is found that the mistake has been carried on for years and that it now affects a dozen different issues of the same pattern in use by a dozen different customers.

What is to be done now? Are the customers to be notified that they have been sold upon an erroneous weight? Are they to be burdened with the red tape necessary to adjust the situation? Is the weight to be corrected in the files and in future quotations is the true weight to be used? Is the foundry to be notified that a dozen metal patterns costing $600 each have been made to conform to an erroneous weight? Any way out involves either expense and the admission of the error or it involves the sacrifice of accuracy and as this latter method is likely to be invoked, let us look at the result from the standpoint of future weight estimates.

If the error is buried, the estimating department will reason—"If the executive engineers can bury mistakes why can't we? Why should we go on calculating pyramidal frustrums with a long formula when we can approximate the result with a quick calculation and no one be the wiser. Why should we re-check every item on an estimate when we can scan the estimate and with fair certainty come within a few pounds of the correct weight?"

There then may enter another source of secondary error. The primary and secondary errors which may be encountered will be studied in the next installment of this series.

Book Review

Light Metals and Alloys-Aluminum, Magnesium, 403 pages, paper, 7 x 10 inches, published by the Bureau of Standards, Washington, and may be obtained from the superintendent of documents, United States Government printing office, Washington, for $1.10.

In 1919 the bureau of standards issued a circular dealing with the physical properties of aluminum and its alloys, but since that time such great and rapid progress has been made in the metallurgy of this element and its light alloys from both the practical and scientific aspects, that the first edition has become out of date and inadequate. This new edition which is bureau of standards circular No. 346, describes the physical and mechanical properties of aluminum and magnesium and their light alloys. The variations in properties which are caused by changing the composition of the alloy, by the presence of impurities, by mechanical working, etc., also are presented. Selection of data available has been made and the data have been checked by representatives of the light-alloy industries to present reliable information. Equilibrium diagrams for the important alloy systems are given and the metallography, corrosion resistance, methods of protection against corrosion, theory of heat treatment and application of the alloys to industry are discussed. A selected and classified bibliography is appended. Metallurgists and foundrymen interested in the field of aluminum and magnesium and their alloys will find this volume a valuable addition to their libraries.

Making a Pattern for a Propeller Blade

By Frederick Leu

Blue prints generally are supplied showing the size and pitch of the wheel wanted and giving shape and sections of various parts of the blade and size of hub. Only one blade with hub is required for the pattern with a hole about 2 inches through the hub. The molder attends to the number of blades required by mounting the hub on a 2-inch spindle and shifting the pattern from one position to another.

The various sections composing the pattern are built up on a plain bed bench which also serves as a rest for the template by which the end of the pattern is tested as it is built. When the sections are all glued in place the pattern resembles a partly opened folding fan.

Assuming the diameter of the wheel to be 8 feet and the pitch 12 feet, a template of the size is laid out in inches with the lines extended to take in the whole width of the blade. The outer thickness of blade also the thickness at the hub end at a point beyond the fillet or curve next to the hub are laid out on this template as in Fig. 1. The template is made of a ¼-inch pine triangle with the grain running up and down, that it may be readily bent, glued, or nailed to a segment about 2 inches thick with an inner sweep equal to the radius of the wheel.

Select the softest 1½-inch pine for the sections. Fig. 2 shows how to obtain the width of sections at the outer end; also near the hub part. Each section is composed of three pieces as shown in Fig. 3. Glue the sections one on top of the other applying the template as shown in Fig. 2 against the ends to get the offset of each section the proper distance with the holes in the hub in line. Needless to say each section is first shaped on the band saw as shown by the dotted line in Fig. 3. Fasten the sections while gluing with four screws at the hub and about four spaced along the line of offset. These latter are withdrawn after the glue has dried, while those in the hub remain. Screws instead of clamps enable the workman to proceed without interruption.

After the sections are built up to the length of the hub, plain sections are added to make up the width of the blade. Lay out the diameter of hub at each end and shape it as per drawing cutting the fillet where the blade joins the hub. An adze is a time saver for roughing out the blade. Use most convenient tools for finishing.

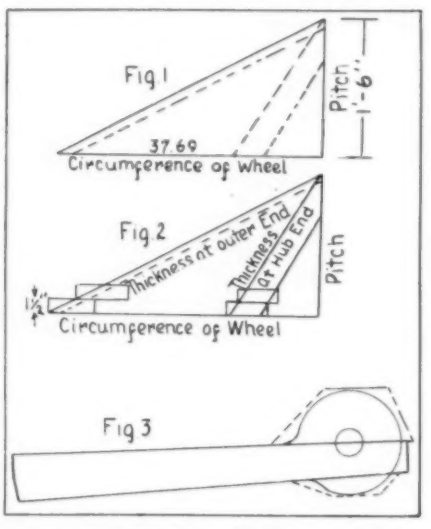


FIG. 1—TEMPLATE SHOWS VARIOUS THICKNESSES. FIG. 2—HOW TO GET WIDTH OF SECTIONS. FIG. 3—ONE OF THE SECTIONS

Determines Nitrogen

Method for the determination of nitrogen in metals by fusion in a vacuum has been developed by Louis Jordan and J. R. Eckman, bureau of standards, Washington. The method is similar to that for the determination of oxygen and hydrogen, and the gases are absorbed in calcium vapor, forming calcium nitride. The amount of nitrogen contained is determined by solution and distillation of the nitride. A description of the apparatus, results obtained, and other data are presented in Scientific Paper No. 563, bureau of standards, price 10 cents.

The fifteenth national foreign trade convention of the National Foreign Trade council will be held at Houston, Tex., April 25 to 27.

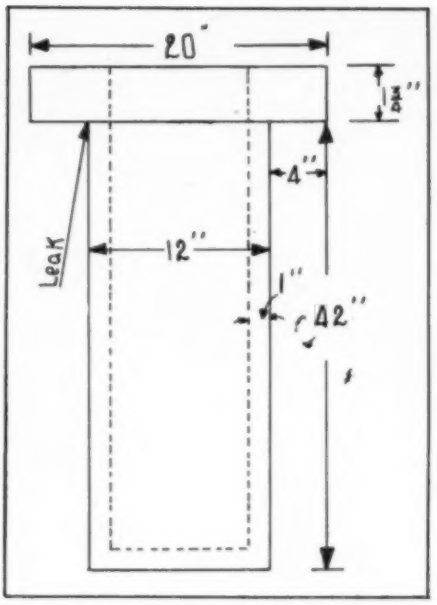
Casting Leaks Around Flange Junction

Question: The heater casting shown in the accompanying sketch has to withstand a pressure of 300 pounds per square inch. Under test we find that many of the castings leak at the junction of the flange with the body as indicated in the sketch. The mold is made in green sand. It is gated on the side of the flange. The mold is not fed, but a small riser is taken off the closed end. The iron in the casting shows a silicon content of 2.20-2.25 per cent. We shall appreciate any suggestion tending to prevent these castings from leaking.

Answer: It is rather difficult to suggest a remedy for a condition that may be due to any one or a combination of several causes. The inquiry further is complicated owing to the fact that you do not state in what position the mold was poured. However, you do state that the casting has to withstand a fairly high pressure test and from that we feel justified in assuming that it is molded in a position that requires no chaplets to hold the core. This is possible with the print end of the core attached either to the cope or the drag, but since you further state that a riser was taken off the closed end, we naturally infer that the core was attached to the drag and the closed end of the casting was covered by the cope.

Acting on the foregoing assumption we are inclined to the opinion that your method of gating is responsible for your trouble with leaking castings. The gate delivers metal to the lower flange and as a result all the metal in the casting has to pass through the flange part of the mold. When the mold is filled, the coldest iron is in the closed end and in the upright walls. The hottest iron is in the flange. The flange is almost twice as thick as the walls of the casting and with the added advantage of being filled with hot iron remains liquid for a greater length of time. The marked difference in cooling time causes some slight segregation at the junction line between the flange and the body and this porous area permits the water to leak through under pressure.

The obvious remedy is to fill the mold in such a manner that the cooling speed of the various parts of the mold is equalized as nearly as possible. This readily may be accomplished by filling the mold through a ring of pencil gates, located on the closed end and fed from a circular pouring basin. Six ⅜-inch diameter gates will be sufficient to fill the mold properly.



THE CASTING LEAKED AT THE POINT INDICATED

A possibility exists that your trouble may be traced to the core. This core is almost entirely surrounded by iron and therefore it is essential that the gas should pass easily through a proper channel provided in the mold for the purpose. If the iron flutters or *kicks* from the core, some of the gas inevitably will remain trapped in the iron in the vicinity of the shoulder formed by the junction of the flange with the body of the casting. This trapped gas will form a porous area through which the water will leak under pressure. To insure a free vent, the core should be made as a shell with a wall not more than 2 or 3 inches thick. It should be made from sharp sand bonded with a minimum amount of binder and baked almost to the point of scorching. If the two halves of the core are bound together firmly with a few strands of wire and if the joint is daubed thoroughly, no iron will seep through to the inside.

Induction Type Furnaces Described in Bulletin

The Ajax Electrothermic Corp., Trenton, N. J., recently has issued a new bulletin describing its oscillator or sparkgap type electric converters and furnaces. This new bulletin contains data and information on the high frequency furnace which previously has not been published. It also gives illustrations and information on a new 3 kilovolt-ampere converter together with photographs and cross sectional drawings of various new models of furnaces made by the Ajax Electrothermic Corp. Several pages have been devoted to the non-technical explanation of the high frequency principle and methods of melting employed in the furnaces manufactured by that company.

Make Personnel Changes

The Truscon Steel Co., Youngstown, O., recently has appointed three vice presidents. C. I. Auten, has been made vice president in charge of sales in the standard building division. M. T. Clark now is vice president in charge of sales of the steel window division. C. D. Loveland, formerly manager of the Pittsburgh district of the Truscon organization, has been made vice president with headquarters at Newark, N. J. and will have charge of sales in New Jersey.

Describes Sand Mixer

The Standard Sand & Machine Co., 5151 St. Clair avenue, Cleveland, recently has issued a looseleaf booklet describing its line of sand mixers. Recent changes in the design of the line of sand mixing machines are explained in the publication. These changes include a drive through a speed reducer, the use of anti-friction bearings throughout, the use of a new type of screen, and the introduction of a vertical lift elevator. The booklet also gives information on the installation and care of sand mixing machinery, dimensions and capacites of various sizes of machines and reproductions of photographs of various parts of the sand mixing machinery. Plan drawings of the equipment also add to the value of the booklet.

Increases Facilities

The Austin Co., Cleveland, recently started building a large two-story and basement addition to its office building Euclid avenue and Noble road. Greater facilities for the engineering department and general office space are being provided at a cost of approximately $50,000. The company also is planning the construction of a new woodworking shop at its steel fabricating plant at Euclid, O. The company reports that the year just passed was the most successful in its history and that the business thus far in 1928 shows a substantial increase. The sales volume for January and February was far ahead of that in the corresponding period in 1927.

E. A. Custer Jr., foundry engineer, addressed the Philadelphia Foundrymen's association at the Manufacturers club March 14 on "The Gray Iron Foundry."

Cleaning Room Progress Aids Production of Quality Castings

By Frank G. Steinebach

Part IV

FOR many years tumbling has been one of the leading methods of cleaning castings. Foundrymen have found through the years of experience that many classes of castings may be cleaned quickly and economically by that procedure. While the tumbling machines in use today operate on the same general principle as those employed at the beginning of the twentieth century, many improvements in design have been made which permit the mills or barrels to stand up under severe operating conditions encountered in the cleaning department. Improvements also have been made in the driving mechanism, methods of closing and fastening doors, methods of loading and unloading, all of which greatly increase operating economies.

The great majority of tumbling mills now in use are either of the round or the square types. In a general way practically all of either the round or the square type mills, which now are being marketed by various manufacturers, have numerous characteristics in common, although each manufacturer features certain details of construction. The shell of the mill barrel is constructed of a high grade steel rolled into shape and bolted to two circular cast-iron heads as may be noted in the accompanying illustrations. In some cases the heads are ribbed on the inside to facilitate the removal of dirt and to prevent abrasion of the head through the grinding action of the load. The heads are lined with perforated steel plates the same diameter as the inside of the mill, which further protect the heads from wear. The perforated plates may be seen in the tumbling mills shown in Figs. 22, 23 and 24.

Heads usually are counterbalanced to provide a perfect fit for the trunnions. The trunnions then are bolted to the head, which permits replacement of trunnions without the removal of the head. The trunnions are supported by heavy cast benches which also support the pulley, clutch and other driving and controlling mechanism as may be noted in the accompanying illustration. The benches are of a substantial design, to support the heavy loads carried by the mill.

Several types of bearings are used to support the trunnions. One type consists of chilled bearing castings supported by oil boxes. The bearings are self-aligning and are protected from dust and dirt by tight-fitting bearing caps. Oil chains keep the trunnions well lubricated from the oil reservoir in the bearing box.

Another type of bearing consists of a solid, cast-iron journal accurately bored and filled with grease. New grease is forced in by a compression cup and at the same time the old grease is forced out through large grooves. Extra heavy babbitted journals are used on still another type mill. One manufacturer now is marketing a line of tumbling mills equipped with roller bearings. The rollers are solid steel, ranging in size from 1-inch in diameter for the smaller mills to 1½ inches for the larger.

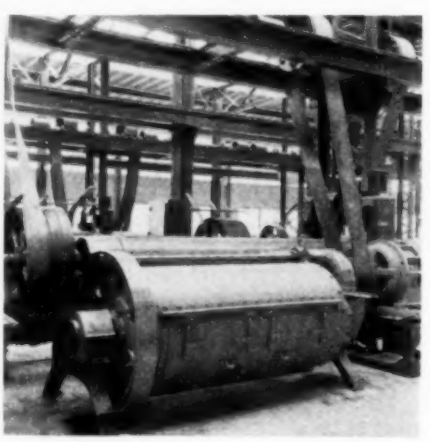


FIG. 12—A VARIETY OF METHODS ARE USED TO HOLD THE DOOR IN PLACE

The design of the control mechanism used on a mill depends largely on the size of the unit, although operating conditions may require special kinds of controls different from those that ordinarily are used on particular types of mills. Common controls include the tight and loose pulley, which is used commonly on the smaller types of mills, a tight driving pulley with an eccentric lever for starting and stopping, or a friction clutch. One manufacturer uses a combination clutch and brake. The brake is so arranged that when the operator moves the lever to disengage the clutch, the brake is applied automatically and when the lever is moved to engage the clutch, the brake is released. Often tumbling mills are arranged in single or double file batteries, especially in the larger plants where a great number of mills are required. The mills then are driven through one common shaft for one entire battery with a control designed to permit starting or stopping one machine without interfering with the other units in the battery. Single units may be attached directly to the motor.

Due to the severe conditions encountered in operation, considerable attention is paid to the design of the opening through which the work is loaded and unloaded, as well as the door which holds the work in the mill. In several types of mills the plate for the shell is of the proper width to leave the correct opening for the

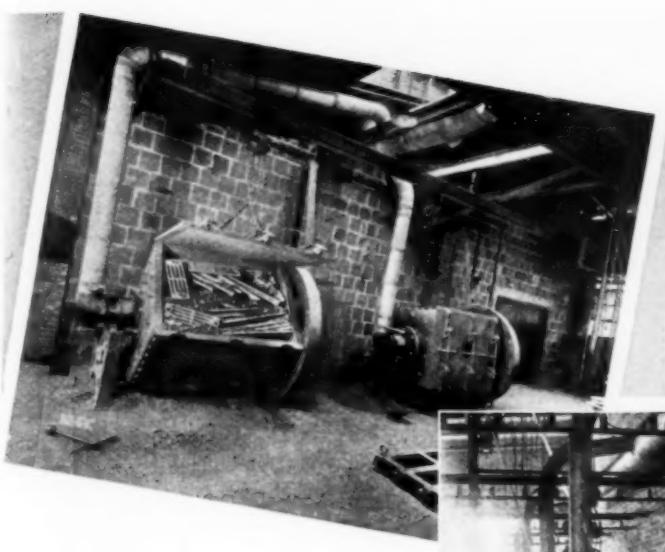


Fig. 13—(Above)—Square Mills Are Used for Tumbling Thin Castings. Fig. 14—(Right)—One Manufacturer Uses Roller Bearings on the Mill

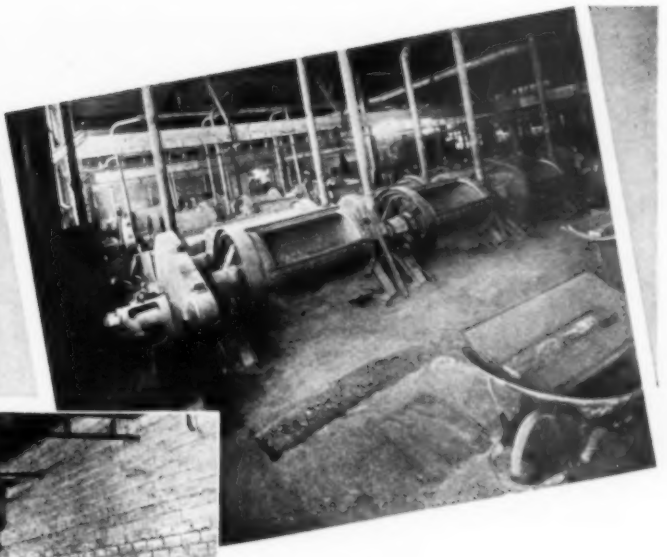
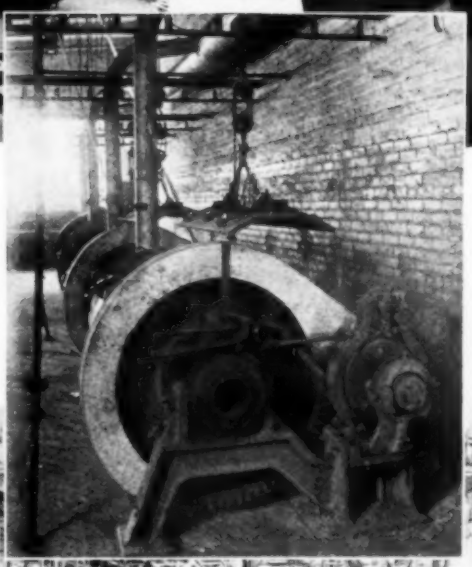


Fig. 15—(Above)—A Battery of Tumbling Mills May Be Driven by a Single Motor Through a Long Shafting



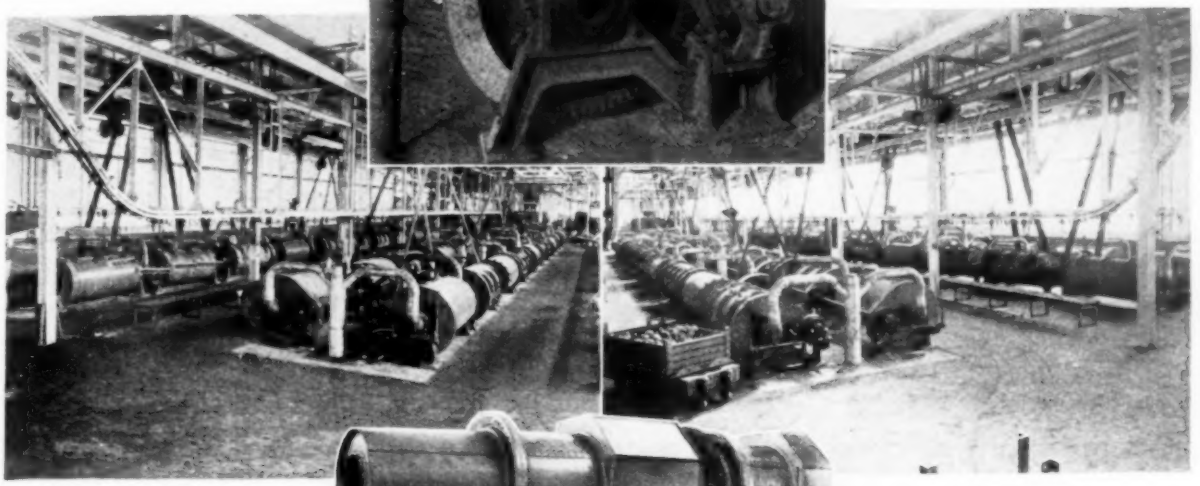


Fig. 16—(Above)—Battery of Mills in a Large Automobile Foundry

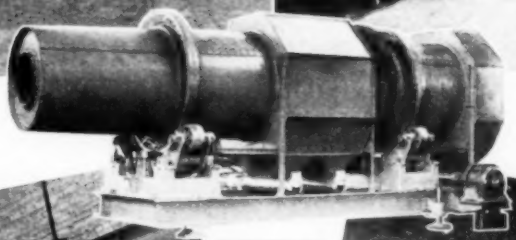


Fig. 17—(Left)—Continuous Type Tumbling Barrel

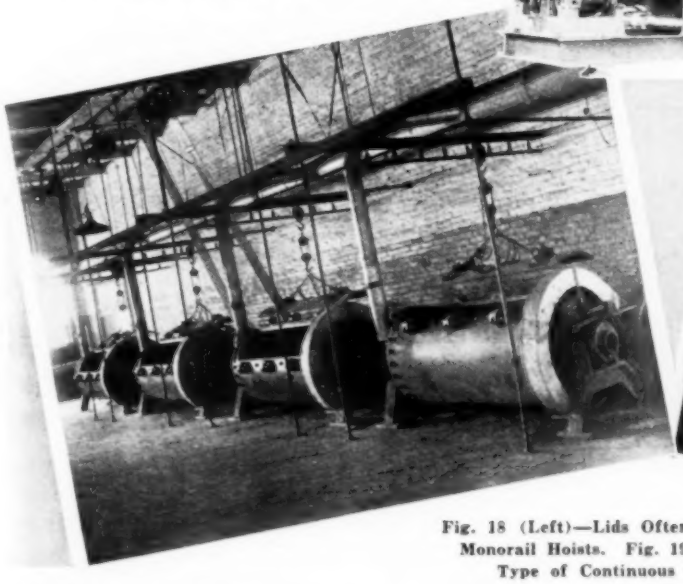


Fig. 18 (Left)—Lids Often Are Handled With Monorail Hoists. Fig. 19 (Right)—Another Type of Continuous Tumbling Mill

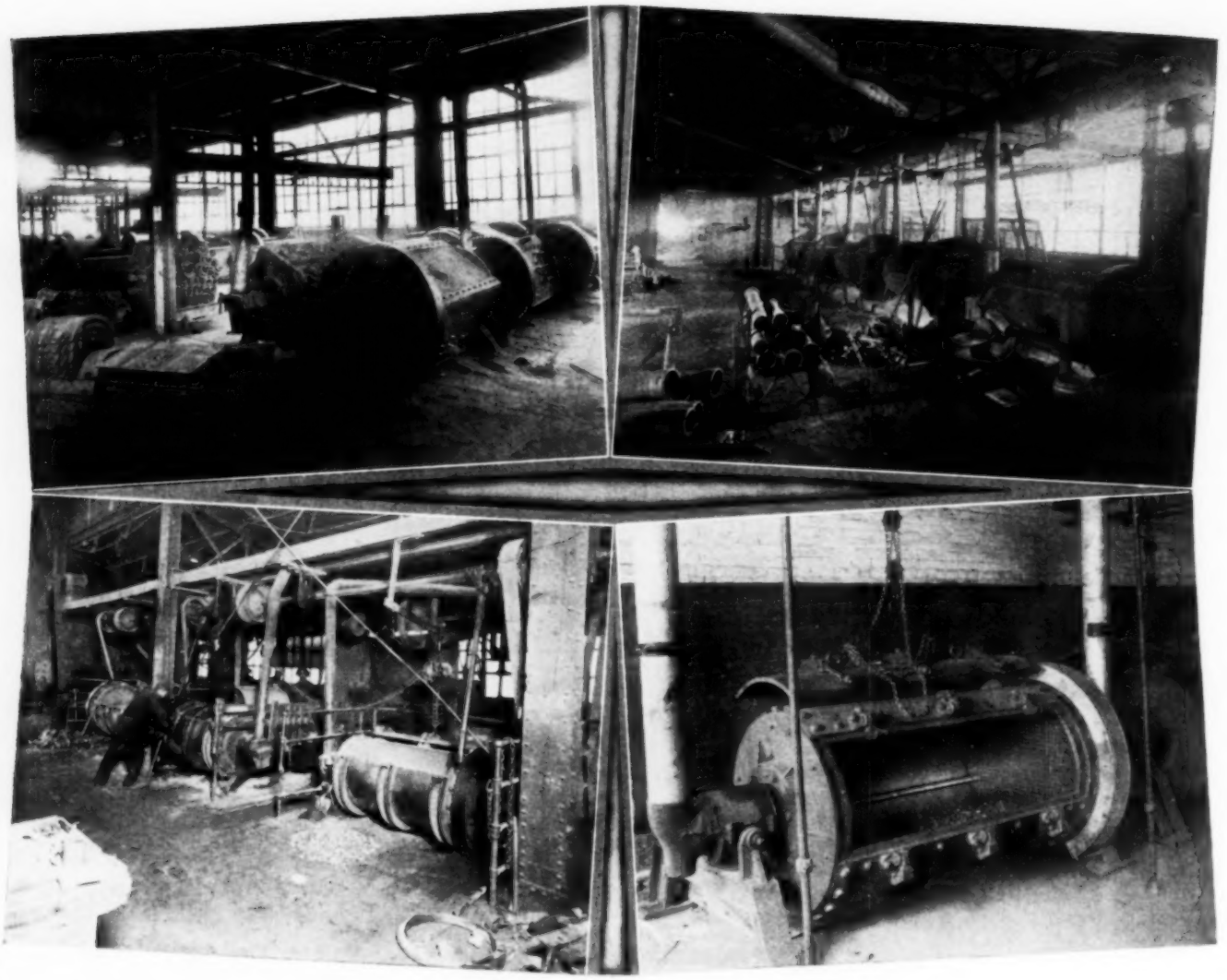


FIG. 20 (UPPER LEFT)—TWO MILLS MAY BE MOUNTED ON THE SAME STAND. FIG. 21 (UPPER RIGHT)—MILLS USED IN A PIPE SHOP. FIG. 22 (LOWER LEFT)—SEVERAL DEVICES ARE USED TO HANDLE THE MILL DOOR. FIG. 23 (LOWER RIGHT)—STARS OF SOME KIND USUAALLY ARE USED IN THE MILL

door when rolled and fitted to the cast iron heads. The door then is constructed of a piece of steel which will fit exactly the opening in the shell, thus making the door flush with the shell as shown in Fig. 23.

In another type the length of the plate used for the shell is the same as the circumference of the head so that when the plate is rolled and bolted to the head, the edges of the shell will meet exactly. The edges then are riveted to a bar on the outside of the shell, all rivets being countersunk and flush on the inside of the barrel. The opening for loading and unloading the castings is burned out of the shell opposite the joint. Considerable stock is left at each end of the plate. The piece removed is riveted to the piece of steel forming the cover, thus making a close fit. The edges of the shell are reinforced heavily at the opening. Peaning strips also are riveted to the inside of the barrel to increase the tumbling action.

A variety of methods are found for fastening the door of the mill in place. One type consists of several clamps placed along the edges of the opening in the shell. The clamps are tightened or loosened easily with a few turns of a wrench. The lid also may be held in place by a flat steel bar running parallel to one outside edge of the shell and extending beyond the edge sufficiently to give the lid ample protection. Simple clamps are provided on the opposite edge of the shell which are tightened with a wrench. Another method requires a steel bar attached to each edge of the shell opening. One side of the door fits under the steel bar while the other side is held in place by a special clamping bar. This clamping bar is set in place under the bar on the mill shell and is locked by engaging levers under latches on the door.

Recently a new type of clamping device has been adopted. This clamp consists of two or more pairs of cast-steel holding bars permanently mounted on the door. Each bar has a cast-steel toggle link or claw at its outer end which engages with cast-steel hooks riveted to the barrel at the edge of the shell opening. When the door is set in place, the claws are engaged by the hooks and the tension bolts, connecting each pair of bars, are turned up tight with a socket wrench. It is claimed that the links provide a toggle action which pinches the door edges tightly against the shell, while the tension in the bolts pulls the sides of the shell firmly against the door.

Usually the doors are provided with handles to facilitate handling. Several manufacturers have developed special door lifting devices which permit one man to remove the door from the tumbler. With this device the door may be swung out of the way while the mill is being loaded or unloaded. Monorail-type hoists and cranes are used extensively to handle the doors, as shown in Fig. 18.

Great progress has been made in the development of equipment to re-

move dust from tumbling mills and today the great majority of mills built are of the dust exhaust type This equipment greatly improves working conditions in the cleaning room and also allows the refuse material to be drawn off, thus greatly reducing the time required for the cleaning operation. The construction of the exhaust system on the tumbling mill is fairly simple. As previously mentioned, the head plate is drilled with a number of holes. The combined area of the holes is greatly in excess of the opening in the trunnion, through which the exhaust is removed from the mill. Air enters the mill in two ways, either through a hollow trunnion at the opposite end of the mill from the exhaust trunnion, or through holes drilled in the shell of the mill. A dust box usually is provided in connection with the exhaust trunnion. This box catches the heavier grit and dirt and allows the fine dust to be carried through pipes to the dust arrester. An extensive dust rmoval system is shown in Fig. 18. It may be noted that practically all the barrels shown in the illustrations are equipped with dust removal equipment.

Experience has shown that many large castings, especially those with rather intricate cores, may be cleaned economically in the tumbling mill. Automobile castings, steam or air compressor cylinders, cast-iron boiler sections, hot-air furnace fire pots and domes, radiator sections, railroad journal boxes and similar castings in many plants are cleaned in tumblers. Special large mills, similar in design to those already described, are used in this work. However, it is essential that the equipment used be of the proper design for heavy jobs. In some cases the large tumblers are equipped with a special backgear arrangement. One type of backgear consists of a cut gear and cut steel pinion, bronze-bushed friction clutch, heavy flywheel pulley and a bench for the extra heavy shaft bearings.

A large number of square tumblers now are in use, especially for cleaning such castings as stove plate, boiler sections, school furniture castings, radiators and other frail work which must be packed closely to prevent breakage. These mills, examples of which are shown in Figs. 13, 20 and 25, usually are of the same general construction as the round types, except that the heads are square and the shell is made up of four plates bolted to the heads. One plate may be removed readily to load and unload the mill. The head plate often is equipped with a special locking device.

Continuous Tumblers

Increasing quantity production in foundries has led to the development of continuous tumbling mills. The continuous mill, which is shown in Figs. 17 and 19, consists essentially of a long mill barrel supported by four rollers and driven through a speed reducer coupled to the driving shaft. Materials to be cleaned, as well as the cleaning elements, are introduced at one end of the mill and are carried to the discharge or opposite end. The cleaning elements fall through the perforations in the inner shell and are returned automatically to the charging end. Jack screws under the feed end are used to regulate the length of time the work remains in the mill. The central section of the barrel is perforated to permit the dirt produced by the cleaning operation to fall into a hopper. The central section also is covered with a hood and the dust is carried away by suction.

Another type continuous mill consists of a barrel supported on rollers built in an angle-iron frame. The castings are loaded into the mill by a power loader skip, which is raised by power transmitted from a center shaft through a contracting band hoist. An automatic stop prevents the loading skip from being hoisted too far. The discharge end of the barrel is equipped with a special plug, which holds the work in the barrel, and a hinged chute which hangs straight down in the drum when the end is closed. When the work has been tumbled the desired amount, a screw is turned by the hand wheel which withdraws the plug and brings the chute into the discharge position. This type of machine is designed chiefly for small work.

While the majority of tumbling mill installations probably consist of the round and square types already mentioned, numerous other designs are on the market. These include a mill built with a shell of steel channel staves, and one with cast iron barrel staves bolted in place. Special water tumbling barrels are built for cleaning and polishing brass castings. The water tumbling mill usually consists of a cast iron or steel plate cylinder mounted on cast iron heads and supported on trunnions. In some cases the inside of the barrel is lined with wood. The work, with the cleaning elements, is placed in the barrel and water is added practically to fill the barrel. During the tumbling action the castings are cleaned and polished.

Some mills are equipped with a connection through the trunnion so that a stream of water may pass continuously through the barrel. The mills are loaded and unloaded through a manhole. A tilting type tumbling barrel also is used in cleaning brass castings. This unit consists of a tapered barrel, made of steel, cast iron or wood, which is mounted at one end

(*Continued on Page* 274)

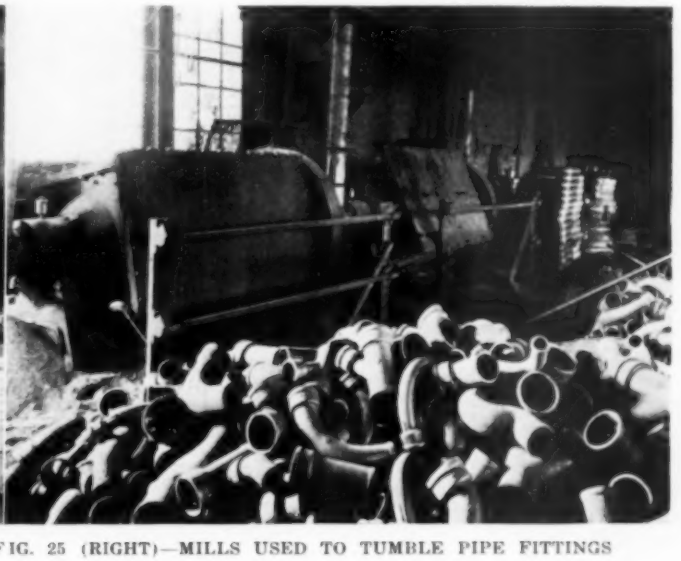


FIG. 24 (LEFT)—METHOD OF LOADING THE MILL. FIG. 25 (RIGHT)—MILLS USED TO TUMBLE PIPE FITTINGS

Bill Touches on Some Problems in Molding-II

By Pat Dwyer

IF THERE is one thing more than another calculated to take the conceit out of a man, it is a view many years later of a picture of himself taken about the time he donned his first pair of pants. Fashions in clothing change imperceptibly year after year. A man adjusts himself to these changes unconciously, just as he adjusts himself to the changes in his features, his stature and circumference. He attaches no significance to the increase in the size of his collar and belt. His outer garments wear out before he notes how they nip him around the waist and under the arms. When he steps on the scales, occasionally, and the pointer jumps a few pounds beyond the previous mark, he remarks carelessly that you can't depend on these scales any more. None of 'em is accurate.

The first intimation he gets that all is not quiet along the Potomac is when he visits the old home town after an absence of 20 or 30 years and inquires after a few people he knew in the halcyon days of his youth. In his mind's eye they never have changed. He is shocked to find he can trace little or no resemblance between big, prosperous looking W. E. Fraser, general manager of the Climax Foundry & Machine Co., and the harum-scarum, gangling young cub who swept out the office in the good old days and who wielded a particularly wicked cue in Humpy Billie's billiard and pool parlor at night. W. E. offers a limp and cautious paw. "Well, well," he says, "so you're Johnny Holtott, eh? Well, sir, I'd never have known you. Le's see, you're living some place away out West, Kansas or Pittsburgh—Oh! Cleveland—yes, yes, I remember, now. I knew it was one of these lake towns. Lake Superior, isn't it? or Michigan? What's that? Erie? Is there a Lake Erie? 'Pon my word, I had forgotten all about that one. Funny how that stuff you learn in school slips out of your mind. The only Erie I seem to remember is a railroad. Well, come in again some time. I'm sorry, but I am rushed to death this morning or I would be glad to take you out and show you the plant."

However, as I was saying, a sight of the ancient photograph puts a man in his place and explains why the old time friends give him the fishy eye. In fact he has difficulty in persuading himself that at one time he actually was the original of the picture.

I was reminded of this the other night when I found the family almost convulsed over an old album some one had resurrected in the annual house cleaning, catch-as-catch-can, tournament. They laughed at their own pictures taken at all times and in all positions when they were children. They laughed still harder at pictures of friends and acquaintances of their parents taken at a time when the aforesaid parents merely enjoyed a long distance bowing acquaintanceship with each other, and even before that time.

Finally they came across a full length tintype of a pathetic looking young fellow apparently about 15 or 16 years of age. After vainly speculating on the identity of this curiosity from the dark ages one of the hilarious group brought it to me and asked if I knew anything about it.

Did I, indeed!

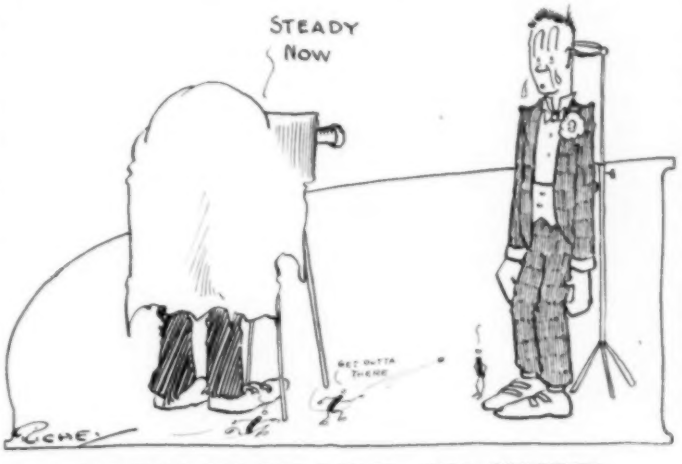
I remembered the day, the very hour I had the thing taken. I still remember the furtive manner in which I sneaked it out of my pocket half a dozen times to gaze upon it in rapture in the short journey between the photograph gallery and the old homestead. How I flushed with mingled pride and dread at the probability of the photographer mounting a copy of the masterpiece in one of the display cases which flanked his doorway. For months afterward I never passed the place without inward trepidation and I don't know whether I was more relieved or disappointed to find that the picture was not exposed to the vulgar gaze.

It was my first picture, taken on my own initiative less than half an hour after I donned my first long pants suit, duly made by a tailor in the prevailing mode, for the staggering sum of $14, my entire earnings for seven weeks herculean labors in the foundry. With a stiff white shirt and standing collar, slightly turned over at the corners, I was in a position to realize to its fullest extent the scope and import of the ancient Biblical phrase: "Solomon in all his glory." Now after a lapse of more years than I care to remember, this ancient tintype comes to light to tickle the risibilities of the family circle. My modest statement that the queer looking bird—to quote one of the comments—was none other than the present speaker as he appeared be-

THE FAMILY HAS A QUIET EVENING AT HOME

tween the ages of 16 and 17, was accepted first with wonder and disbelief and then with affectionate hilarity. Their mother was appealed to for confirmation, but she skilfully side-stepped by saying she had not known me in the polliwog stage of my existence.

Viewing the caricature with a dispassionate eye, I was rather inclined to agree with her characterization. However, I protested mildly that her choice of descriptive terms was not quite as happy as it might have been. She cheerfully admitted the claim, but said it was the best that occurred to her at the moment. A proper feeling of charity and loyalty was all that prevented her from telling me what the picture really resembled. Perhaps she was right. If I had not been absolutely certain that I had posed for the picture I would not have recognized it as mine. At the time it was made I thought the photographer was all kindness and solicitude, but looking back now I am convinced he must have had his tongue in his cheek while he pushed my hands and feet into place after the manner of an amateur taxidermist, manipulating a stuffed dog.



PASSWORD FOR THE DAY IS "ALL KEE-RECT"

One hand firmly grasped the top of a chair, while the other hung limp and apparently useless by my side. The right foot peeped coyly from under the spring bottom of a pant's leg. The left leg was bent at a genteel angle across the right with the toe of the left shoe resting on the floor about 6 inches to starboard and slightly aft of the right toe. Mixture of emotions caused by the photographer's request to look pleasant had resulted in a facial expression worthy of the Prodigal Son when he came sneaking in the back door, hoping for a smile, but expecting a good swift kick.

Cut and hang of the clothes, the height of fashion at one period, now look like those you see on an effigy designed to scare the crows away from a cornfield. They might have served as the original in the famous old conundrum of why a sailor's trousers resemble two towns in France. They were Toulon and Toulouse, pronounced of course in the proper French manner too long and too loose.

Bill came in while the seance was in full swing. To test his memory I asked him if he could identify the picture. He could. Also it seemed to affect him in the same manner it had affected the other members of the cheerful little family group.

"Well," said he, "I'll tell you. If I saw it for the first time I probably should say it was the picture of a tough young village cub, up before the beak for feloniously tying a tin can to a dog's tail or for stealing a clutch of eggs from under the widow Maloney's brown hen.

"However, as it happens I was with your Paw on the momentous occasion he squandered his money to gratify his silly vanity. You can see for yourselves what grounds he had for his belief. The reason I remember the occasion so distinctly is because in a manner of speaking I paid for the picture. He had been saving his money for five or six months to buy a suit—"

"Not months," I hastily interrupted. "It was only seven weeks and—"

"Well," said Bill, "it seemed like months. I know you were as tight as the cork in a bottle. You had 75 cents left over after paying for the suit and I had looked forward confidently to separating you from that exact amount in Humpy Billie's place during the afternoon. In fact I had my plans all laid for the disposal of this tidy sum to the best advantage. You can imagine my cruel disappointment, the poignancy of my mental anguish when this rosy program was knocked galley west for a row of lamp posts. Can you wonder that I remember the incident? To my mind the marvelous feature would be that I ever should forget it. If the picture was worth a plugged nickel I might have borne up under the affliction and the sense of being cheated, but—well, look at it—take a good look at it and weep!

"It seems to me," Bill continued, "that you shot the whole wad and had the photographer make you three of the valentines. What became of the other two and how is it you happened to keep this thing all these years to remind you of your shame?"

"Bill," I said, "you know I would not tell you a lie. I—"

Loud groans from Bill assisted by the entire company.

"As I was saying," I went on calmly, ignoring this wretched display of poor taste and shocking incredulity, "I don't know what has become of the first two and most assuredly I have not the faintest idea of how this copy happened to be preserved in the family archives. I remember the two charming little maidens on whom I bestowed the chromos in exchange for a trifling consideration, which is neither here nor there. These same little maidens long since have developed into dignified matrons and I shudder to think of their hilarious comment if the pictures still are in existence. I don't mind a man poking fun at me, but the idea of being held up to ridicule by a fat old woman with a wheeze and four chins is enough to make a man want to bite the head from a railroad spike." "Isn't it the truth?" Bill remarked sympathetically. "Let us turn, dear brethren, to a more congenial subject. The last time I was here we were talking about the unreasonable customer who wanted a highly finished tank casting for a price that hardly covered the cost of making it in open sand. So far as utility of this particular casting is concerned an open sand mold will produce a perfectly satisfactory casting, but even an open sand mold involves a considerable amount of work, and in this particular case a considerable degree of skill and knowledge on the part of the molder.

"To keep the expense down to the absolute limit and thus be in a position to earn an honest penny on the job, the foundryman gets along with what you might call just the rudiments of a pattern. Just plain sides and ends screwed together at the corners either permanently or in such a manner that the screws may be removed as the ramming of the sand progresses. Under certain conditions it is easier to draw the pattern one section at a time than to attempt to draw the entire pattern at one lift.

"An improvement on this form of construction for extremely deep patterns is a pair of rectangular frames against which a sufficient number of slabs are erected to form the walls of the tank. One frame is placed on the bottom of the mold and the second is propped up to a point corre-

sponding to the top face of the tank. The slabs are tacked temporarily in place until the sand has been rammed around the mold on the outside. Then the lower frame is removed and sand is rammed on the inside of the slabs up to the second frame. It is then taken out and the slabs are drawn one at a time. A great deal of difficulty sometimes is experienced in drawing deep patterns made according to the first formula, where the boards in the pattern are laid horizontally and where they sometimes warp through dampness. The shorter pieces laid vertically are not so inclined to warp and even if they do it will not be in a direction to affect their ease of withdrawal from the sand. A pattern made according to the first plan should be provided with flat steel draw straps, either recessed into the face of the pattern or screwed on the outside, depending on whether the face of the casting has to be perfectly plain or not. In some instances the projecting surface on the casting left by the strap on the pattern is not regarded as a defect. In other instances where objection may be raised to its presence, the gap in the sand may be filled after the pattern has been removed from the mold. Some patterns are so thin that a recess for the lifting straps would render them unduly weak. A suitable hole is dug in the foundry floor, or if a good stiff iron flask is available it may be utilized. The advantage of the hole in the floor is that the same sand that is dug out is shoveled back in again around the pattern. The flask must be filled from a pile either by hand or with a grab bucket suspended from a crane. Local conditions determine which of these methods is the more advantageous. If a flask is employed to hold the mold for a long, deep casting, it must be braced in the center to prevent it from spreading under pressure. If the casting is made in a hole in the floor, precaution must be taken to see that the floor in the vicinity all around is firm and solid. Soft ramming sometimes is blamed for swollen and distorted castings that really have been caused by insufficient support to the walls of the mold. The flask has sprung or an adjoining pit has allowed the wall to move.

"By a suitable hole is meant one at least 6 inches deeper than the pattern to provide room for a coke bed. Space around the sides and ends of the pattern will vary from 6 inches for a pattern 12 inches deep, up to 15 inches for a pattern 3 feet deep. In some instances part of the time and labor involved in digging a deep hole may be saved by utilizing a flask to form the upper part of the mold. It is not lowered into place until sand has been rammed around the pattern up to a point flush with the normal floor level. Occasionally it may be advisable to carry the sand up the inside and the outside of the pattern simultaneously, but the usual practice is to ram the outside of the mold first and then rap the pattern before ramming sand on the inside. This preliminary rapping breaks the intimate contact of the sand with the pattern and facilitates drawing the pattern out of the sand later.

"Style of runner adopted will depend to a great extent on the general size and shape, but principally on the depth of the casting. A plain basin discharging over the edge into

DEAR LITTLE MAIDS WILL GROW

one end will serve satisfactorily for castings up to 12 inches in depth. Above that it is advisable to place inlet gates near the bottom of the mold. On exceptionally large tanks the bottom gates are supplemented by other gates higher up. In special instances where a doubt may exist as to the fluidity of the iron, or where in all probability the sluggish iron rising through the narrow sides from the bottom gates, may not cover the flat bottom of the casting easily and rapidly, the runner basin is so designed that it may be flooded, thus throwing hot iron from the ladle directly over the flat bottom face of the mold. Where two ladles are employed to pour one of these castings, the iron from one ladle is poured through bottom gates at on end while iron from the second ladle is held back until the first ladle is partly emptied. Then the iron from the second ladle is poured directly into the mold from an open wide mouth basin.

"To insure a clean solid bottom in the casting it is essential that the steam and gas shall escape readily downward instead of boiling up through the iron. A coke bed is placed under the pattern. For exceptionally deep castings this flat bed is supplemented by a high mound in the center or by a second bed laid within 4 or 5 inches of the top of the body of sand and connected to the lower bed by pipes or by short coke columns. These columns are formed by ramming wood blocks, empty buckets or nail kegs in the sand, removing them at the proper height and packing the holes full of coke. Sand on the inside of the pattern must be rammed quite firmly near the bottom to resist the pressure of the molten iron, but the density may be decreased steadily at each successive ramming until at the top no rammer is needed. The last course is tramped lightly with the feet and then vented liberally with a wire before the strike is employed to form the flat surface. Some molders prefer to vent the sand with a large wire while the surface is still about one inch below the desired height. A thickness of facing then is shoveled over the surface and either tramped down or beaten down with a straightedge. The entire surface then is vented with a fine wire. The practice is commendable and even necessary where the sand is inclined to be tight, but tight sand should have no place in work of this kind. The movement of the strike in forming the face of the mold usually is sufficient to close the vent holes in the sand on the face close to the surface. Any that remain open are closed with a small pinch of sand. A thin film of sand is sprinkled through a sieve over the face and slicked down with the trowel. This is followed with a coating of blacking shaken through a bag and also slicked. This treatment, particularly if the facing sand contains a little coal dust, approximately one part coal dust to eight parts sand, will insure a clean face on the inside of the tank bottom. However, coal dust facing exerts a retarding influence on the flow of liquid iron and for that reason must be used with discretion. Many castings that come perfectly from plain sand molds, will show misruns and cold shuts if poured in a mold where coal dust is mixed with the facing sand. Exceedingly hot iron will run an extraordinarily long distance, but even under the most favorable conditions, iron will not run as far in an open sand mold as it will in one that is covered and in which the iron enters from an elevated runner that puts pressure behind it.

The FOUNDRY Family Photograph Album

Upper Left

W. L. SEELBACH

Forest City-Walworth Run Foundries Co., Cleveland

Lower Left

G. B. PICKOP

Malleable Iron Fittings Co., Brantford, Conn.

Upper Right

S. M. VAUCLAIN

Baldwin Locomotive Works, Philadelphia

Lower Right

L. J. BELKNAP

Worthington Pump & Machinery Corp., New York

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

A LEXICON OF TECHNICAL TERMS

By O. W. Potter

(Continued from Data Sheet No. 708)

Calescent, Recalescent, and Decalescent Point

That point at which the normal cooling or heating rate is arrested or changed when heating or cooling slowly and at a uniform rate through a critical range of a solid. The temperature is arrested at the critical points of that range. This is due to the emission or absorption of heat as a result of a physical change within the material at this temperature. This point is called the *recalescent* point on cooling and the *decalescent* point or *absorption* point on heating. When the phenomena of either decalescent or recalescent is referred to in a general way the term *calescent* point is used. It is analogous to the heat absorbed or given up when changing from a solid to a liquid or a liquid to a vapor. See Critical Temperature, and Fig. 4.

Annealing Temperature

That temperature at which annealing is obtained best. *Annealing* commonly is understood to mean a heating operation followed by slow cooling to produce one or more of the following results:

To completely undo the effects of a hardening (softening).
Remove strains which may be produced by working or hardening or casting.
Refinement of grain.
To aid machinability.

Annealing temperatures for ordinary carbon steels as recommended by the American Society of Testing Materials are as follows:

Range of Carbon Content	*Ranges of Annealing Temperature*
Less than 0.12 per cent	875-925 degrees Cent.
0.12-0.25 per cent	840-870 degrees Cent.
0.30-0.49 per cent	815-840 degrees Cent.
0.50-1.00 per cent	790-815 degrees Cent.

Hysteresis Temperature, Temperature Interval, or Hysteresis Gap

This is the gap between any critical point on heating and cooling. It is different in the various alloys and substances, and is affected considerably by rates of heating and cooling. When there is a considerable gap (about 100 degrees Cent.) it is said to be *non-reversible;* if the gap is small it is said to be *reversible.* It often is defined as the resistance of bodies to undergo transformations.

Recrystallization Temperature

a. That temperature at which a complete new crystal structure (grain structure) is formed in a cold worked metal. This temperature varies with the amount of cold working; the more severely worked, the lower the recrystallization temperature. It also is varied for alloys of different chemical analysis.

b. That temperature at which a complete new crystal structure (grain

(Continued on Data Sheet No. 712)

A LEXICON OF TECHNICAL TERMS

(Continued from Data Sheet No. 711)

structure) accompanied by a change in space lattice is formed in metals, for example, heating and cooling of steel through the critical range.

The approximate recrystallization temperature of nearly pure iron under severe cold working is given at 450 degrees Cent.

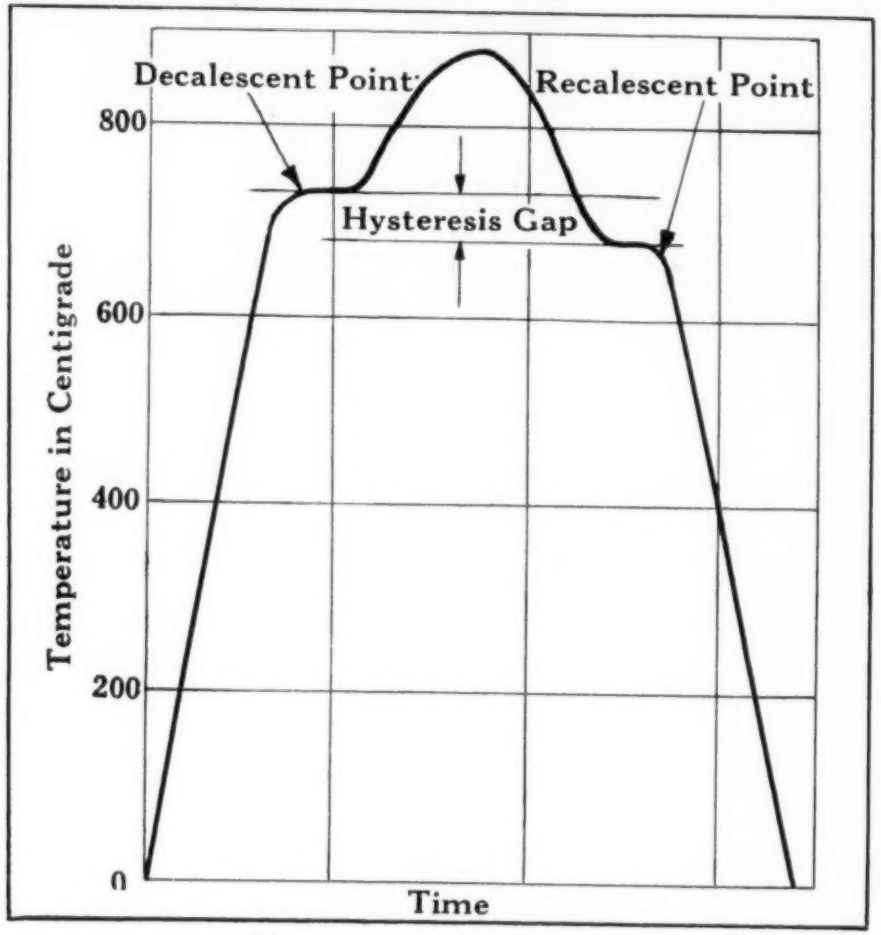


FIG. 4—TIME-TEMPERATURE GRAPH

(Continued on Data Sheet No. 713)

How and Why in Brass Founding

By Charles Vickers

Compares Two Brasses

We are studying seriously the design and manufacture of a new line of compression plumbing brass goods, such as bibbs, faucets, stops and so forth. Heretofore, we have used ounce metal 85, three fives, for such castings. We find though, a large majority of the plumbing brass goods are made of various mixtures of yellow metal, some of which run as low as 65 per cent copper, 1 tin, 2 lead, balance zinc. We have looked over all available note books on the subject and have discussed the matter with a good many foundrymen. Each seems to have his own theory as to what constitutes the best mixture, but their ideas do not appear to be based on any real knowledge, of mixtures other than their own particular favorite. The yellow metal men tell us their mixtures have greater tensile and transverse strength, that they machine easier and enable them to produce less defectives.

The red metal men also claim they have less defective castings, and trouble with blow holes, that they have a stronger metal and that the yellow alloys will corrode. We would value your opinion in regard to this question, we want a mixture that will answer the requirements of the plumbing trade which needs a brass that will not corrode easily, will be strong enough in the stem part to resist torsional strains without breaking, that will withstand wear, and at the same time will work well both in the foundry to give sound castings, and in the machine shop to machine easily and not wear out tools. We will appreciate your suggestions.

As far as strength is concerned there is little to choose between a red or yellow metal; thus a yellow brass of the formula; copper, 70 per cent; zinc, 27 per cent; tin, 1 per cent; lead, 2 per cent will have from 28,000 to 30,000 pounds tensile strength; with elongation from 22 to 28 per cent. Its brinell hardness number is 50 to 55. A red metal of a standard composition such as copper, 83 per cent; tin, 4 per cent; zinc, 7 per cent; lead, 6 per cent will have a tensile strength of from 28,000 to 33,000 pounds per square inch, with elongation from 15 to 20 per cent, brinell hardness number 55 to 60. The red metal is thus a trifle harder than the yellow metal, a little less tough, but of about the same tensile strength. A trifle more tin taken from the copper content of the yellow mixture would make it identical in physical properties with the red metal. As far as the physical properties are concerned there is nothing to decide the question of which alloy is best. The two alloys mentioned are fairly representative of the two classes.

As most plumbing goods are nickeled it makes no difference whether the metal underneath is red or yellow in color, when the nickel is worn off in spots either color looks bad, but when brightened it is probable the yellow has the shade the best of the controversy, as it will not stand out so strongly as the red brass. For gold-plated ware though the red brass would be better after the gold began to disappear. However, any advantage of color is not a strong one for either mixture and generally would not be considered.

When it comes to cost thought, there is a decided advantage in favor of the yellow alloys and the thrifty soul using the alloy containing 20 per cent zinc, may think he can undersell anyone using ounce metal or commercial red brass with 7 per cent of zinc. The price of the yellow alloys appeals strongly to some manufacturers, and is permitted to overshadow all other considerations, such for instance as ease of manufacture and low loss in making castings. The result we have known in some cases has been that costs have been underestimated, causing prices to be quoted too low.

As far as the machining part of the manufacturing process is concerned, a yellow brass containing from 2 to 4 per cent of lead will not machine as easily as a red brass containing 7 per cent of lead for instance, although the tin content exerices a considerable influence on the machining qualities in spite of the lead content. It is our opinion, though we have no facts to support it, that the two alloys we have taken as illustrations will machine about the same. The machining quality of any alloy is quite often a matter of opinion, or imagination on the part of the operator, coupled with knowledge of suitable tool grinding. As far as the merely physical properties of strength, color and machinability are concerned, one kind of alloy is about the same as the other, with the advantage of lower costs favoring the yellow alloy.

When it comes to working well in the foundry experience overwhelmingly favors the red brass. That is why the more expensive alloy is used so much. Pouring the molds is a critical operation with any nonferrous alloy, but with yellow brass it is ten times more so than with red brass. For yellow brass the molds have to be vented, not so much with a needle vent wire through the cope and drag, but with joint vents, that is vents drawn through on the mold parting. Also, channels ought to be dug in the sand in the cope after the mold is closed, to provide egress for the gases generated during pouring. Difficulties progressively increase with increase in zinc content, and with over 35 per cent zinc, it is not possible to make sand castings without heavy casting losses. The addition of aluminum helps the casting properties, but increases other difficulties.

Some manufacturers have arrived at a compromise between red and yellow brass, and use such alloys as copper, 77 per cent; zinc, 14 per cent; lead, 7 per cent; tin, 2 per cent, which on account of the high lead content is a red and not a yellow metal.

This brass alloy casts well, but is much addicted to splitting, that is, certain shapes split into two parts after being turned. It seems to work well for bodies and is used extensively. Such parts as stems though have to be made of a stronger mixture. As far as corrodibility is concerned yellow metal will not corrode in ordinary waters any faster than red metal. The compromise alloy we have just mentioned has a good record in waterworks work for over 25 years.

Bronze Withstands Shock

We are asked to furnish a bronze bushing about 24 inches long and 16 inches diameter and would like to know of a suitable alloy, as the bushing will be subject to a tremendous intermittent shock.

Use the following alloy: Copper 84.50 per cent; tin 10 per cent; lead 5 per cent; phosphor copper 0.50 per cent.

Simple System Controls
Production Sequence

By Jack Davis

IN these days of quick delivery when every foundryman is trying to get orders shipped when promised, an efficient system of production control is of the greatest value. Since the problem of getting the castings out in the proper secquence is of major importance in most foundries at the present time, it is usually a good idea to lay out carefully the work of the production department and see that it works along a well defined plan.

In many of the foundries the selection of the job to run next is left to the foreman who selects the one most convenient or one which will cause less trouble in the hands of the molder. Usually the most difficult patterns are postponed as long as possible. Then a little later every one is shaken up when it is found that castings are not made when they should have been delivered, while some others which could have come along a little later without any inconvenience.

Most shops have a production manager or at least a production clerk who is in a position to know when castings are wanted and whose job it is to see that the patterns are made in the proper sequence. In my own experience as a foundry foreman it has been extremely hard at times to follow schedules laid out by the production clerk. I have had instructions to run nearly a dozen jobs ahead of all others. This, of course, is impossible and all that could be done was to forget instructions and use one's own judgment.

Another method is to give the foreman a list of all patterns which are wanted at once and let him run others as he sees fit. Occasionally he is called into the front office to explain why in the name of the great *Whosis*, hasn't he finished that order for Blank & Co. Still another method is to use various colored cards attached to the pattern such as red cards for rush work and the white cards for the ordinary run. The practice of placing the delivery dates on pattern cards also is used and helps when a better method is not in use.

The system described herein was worked out to relieve myself of the responsibility of getting my work out in the order wanted and to place it where it belongs, on the production manager or clerk. A foundry foreman is usually a busy man and hardly can be expected to remember a long list of jobs and the order that they

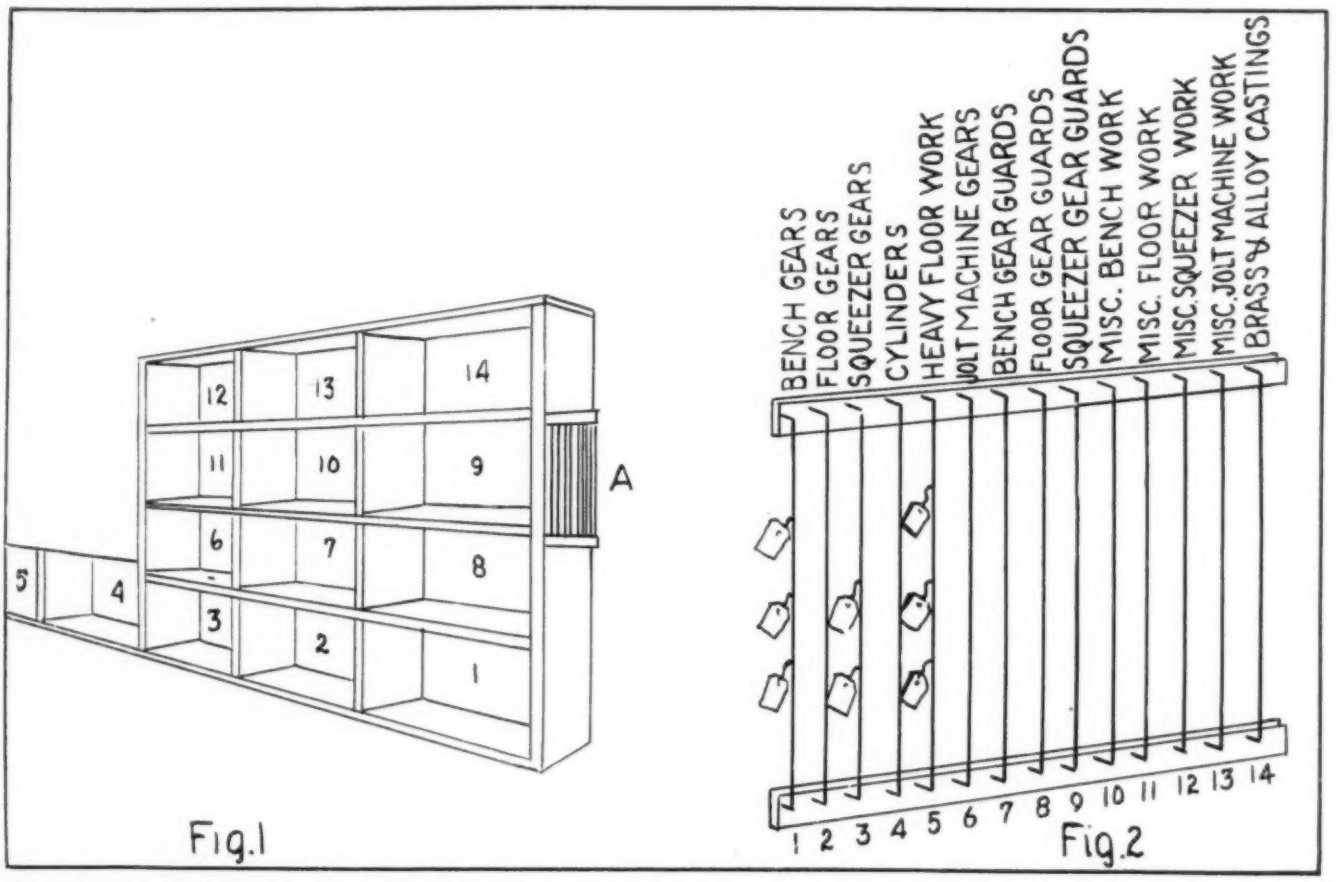


FIG. 1—PATTERNS ARE PLACED IN BINS OR ON SHELVES WHICH ARE LABELED FOR EACH CLASS OF PATTERN. FIG. 2—A TAG CONTAINING THE PATTERN NUMBER AND DATE WANTED IS PLACED ON THE PROPER WIRE ON THE SCHEDULE BOARD. THE POSITION OF THE TAG ON THE WIRE CONTROLS ITS CASTING DATE

are expected to appear in the cleaning room.

The system consists of dividing the work into several classes, the number depending on the kinds of work made and the methods in use to make it. For example, one shop might divide its work into several classes such as, squeezes, bench, floor and roll-over machine work. It can be further divided as desired since most shops have their men trained or broken in on certain kinds of work. Floor work can be divided as cylinders, gears, gear guards and miscellaneous work. In our plant we have fourteen classes of work as shown in Fig. 2.

After all patterns are classified they are placed in compartments as shown in Fig. 1 as soon as they reach the foundry. Each compartment or bin receives only one class of patterns and bears a label showing what kinds of patterns are to be placed in it.

When any pattern reaches the foundry, the production clerk places it in the proper bin and copies the pattern name and number on a small tag. Next he learns when the castings are wanted and places the tag on one of the wires of the schedule board shown in Fig. 2 and at A in Fig. 1, which is also labeled with the class to which the pattern belongs and which corresponds to the label on the bin where the pattern was placed.

The position of the tag on the wire determines the sequence of that particular pattern. If the casting is wanted before all others which have preceded it, the tag is placed above all others on the wire. In case it is needed after some of the others and yet ahead of some which are not in a hurry, the tag would go just under those which are wanted ahead of it and just over those which are wanted later.

The next step is for the foreman to remove the top tag from one of the wires when assigning work to a molder who is accustomed to making the kind of castings in that class. Having removed the tag he takes the pattern from the corresponding bin and gives it to the molder. Then unless some other record is kept he returns the tag with the molder's name or number to the foundry clerk.

The coreroom production is also governed by the position of the tags on the wires but the coreroom foreman does not remove the tags. However, it is advisable for him or the foundry clerk to mark the tags when the cores are finished.

For example: Three patterns arrive in the foundry which we shall call *A*, *B*, and *C*. *A* is a small gear which is molded on the bench. The production clerk places the pattern in the bin marked bench gears and writes the pattern number on a small tag. Then upon finding that the *A* casting is needed at once he places the tag uppermost on one of the wires which is also marked bench gears. This pattern is then given out for molding before any of the others by the simple rule of taking the top tag off the wire and getting the pattern with the corresponding number.

B is a grate casting which will be needed in a few days but not as soon as some other floor jobs already in the foundry. This pattern goes into the bin marked miscellaneous floor work and the tag is placed on the wire with the same label just under the tags representing jobs which are to go ahead of it.

C is a squeezer board and the castings are not wanted for some time and the tag goes on the bottom of the wire marked squeezer work and works up the wire as tags are taken off the top and others are added at the bottom.

Ordinary paper clips are used to attach the tags to the wires and permits them to be placed in any position on the wire without removing any of those already there. This system enables the production department to control the sequence of the casting work going into the foundry.

Undertake Steel Casting Tests

ACCORDING to a recent report presented to the American Foundrymen's association by Major R. A. Bull, representative on the joint committee on the investigation of the effects of phosphorus and steel, 8 heats of acid open-hearth steel were made at the foundry of the Atlantic Steel Castings Co., Chester, Pa. From these heats 288 bars for the laboratory tests and reserve material of the committee were cast. The bars were poured in the presence of the delegated representatives of the committee including Mr. Corbett, Steel Founders' Society of America, and Major Bull.

Efforts were made to eliminate every controllable variable factor. The heats of 7½ tons each, were produced from pig iron and carefully selected scrap containing low percent-

Table I

Heat Treatments for Various Bars

Annealing

0.25 Per Cent Carbon Steel

Hold at 1650 degrees Fahr. for two hours and cool in furnace without opening door. Permissible to open few small vents in top of furnace to allow escape of heat.

0.45 Per Cent Carbon Steel

Hold at 1600 degrees Fahr. for two hours using same procedure as for 0.25 per cent carbon steel.

Normalizing

0.25 Per Cent Carbon Steel

Hold at 1650 degrees Fahr. for two hours and withdraw from furnace while at this temperature, each bar to be quickly placed to one side away from contact with others bars and on same surface which is at room temperature; all for the purpose of providing the same cooling operation for each side of every bar and give it a true normalizing treatment.

0.45 Per Cent Carbon Steel

Hold at 1600 degrees Fahr. for two hours and use same procedure as for 0.25 per cent carbon steels.

Normalizing and Drawing

0.25 Per Cent Carbon Steel

Hold at 1650 degrees Fahr. for two hours. Withdraw from furnace to cool as described above for normalizing. Reheat to 1150 degrees Fahr. and hold at this temperature for 3½ hours and cool in furnace.

0.45 Per Cent Carbon Steel

Hold at 1600 degrees Fahr for two hours. Withdraw from furnace to cool as for the 0.25 per cent carbon steel. Reheat to 1250 degrees Fahr. and hold at this temperature for 3½ hours, and furnace cool.

In all heat treatments the bars are to be heated gradually to the temperatures recommended, although there is to be no restriction as to rate of heating.

Actual and Desired Chemical Analyses

	Actual Carbon	Desired Carbon	Actual Mn.	Desired Mn.	Actual Si.	Desired Si.	Actual Phos.	Desired Phos.	Actual Sul.	Desired Sul.
					Class A					
1275	0.28	0.25	0.78	0.70	0.39	0.35	0.034	0.025	0.043	0.045
1279	0.30	0.25	0.73	0.70	0.33	0.35	0.042	0.040	0.042	0.045
1282	0.29	0.25	0.83	0.70	0.32	0.35	0.063	0.060	0.047	0.045
1284	0.28	0.25	0.60	0.70	0.33	0.35	0.070	0.070	0.045	0.045
1281	0.26	0.25	0.75	0.70	0.36	0.35	0.093	0.100	0.044	0.045
					Class B					
1277	0.48	0.45	0.78	0.70	0.39	0.35	0.037	0.025	0.051	0.045
1276	0.48	0.45	0.70	0.70	.....	0.35	0.050	0.050	0.042	0.045
1280	0.47	0.45	0.72	0.70	0.37	0.35	0.065	0.070	0.044	0.045

ages of phosphorus and sulphur. Iron Pyrites and ferrophosphorus were added to the bath approximately 1½ hours before tapping to provide the desired contents of sulphur and phosphorus.

Open top molds which had feeding blocks 4 inches thick above 6 ribs 12 inches long and 1⅛ inches square, were made from a mixture of pure silica sand bonded with fireclay and molasses water. These molds were jolt rammed, each with 100 jolts and then thoroughly oven-dried.

The extent to which the Altantic foundry succeeded in making the metal of the desired compositions is shown in Table II, and as pointed out by Major Bull reflects credit on the skill of the foundrymen concerned.

Laboratory tests for tension, impact, hardness, fatigue, compression and torsion, all at normal temperatures, will be performed at the Watertown, Mass., arsenal and the naval engineering experiment station, Annapolis, Md., after the bars have been heat treated. Heat treatment will consist of furnace-cooled annealing for normalizing, and also normalizing and drawing. These operations will be carried out at the bureau of standards, Washington. The details of the heat treatments are given in Table I.

The expense of making the experimental foundry steels was defrayed from a fund obtaind by individual contributions solicited by the American Foundrymen's association, by a contribution by the Steel Founders' Society of America, and by contributions by members of the Electric Steel Founders' Research group. All told, 110 steel castings firms shared in absorbing this expense. This gives gratifying evidence of the keen interest taken by the steel casting producers in this investigation.

Discusses Electric Heat

The spring meeting of the American Electrochemical society will be held at the Hotel Stratfield, Bridgeport, Conn., April 26 to 28. The session on Friday morning, April 27, which will be devoted to a discussion of industrial electric heating, should be of interest to foundrymen. A new film entitled "Electric Heat in Industry" showing the uses of electric heat in large industrial plants, will be presented in addition to the discussion. Immediately following the session on electric heat, Dr. B. D. Saklatwalla, chairman of the electrothermic division of the society, will preside at an informal round table discussion on "Refractories for Electric Brass Melting." Special entertainment will be provided for the visitors at the spring gathering.

Cleaning Room Progress Aids Production

(*Concluded from Page* 267)

on a heavy base. The barrel is driven through a gear, mounted on the bottom of the shell. The tilting mechanism is actuated by a hand wheel. If gentle tumbling is required, the barrel is elevated to a fairly high position, while if violent action is desired, the barrel is run in a position nearer the horizontal. The top of the barrel is open at all times so that the work may be inspected.

E. A. Custer Jr., in an article in the Nov. 1 issue of THE FOUNDRY, mentions a hydraulic abrasive tumbler which now is being developed. Castings to be cleaned are fed into the open receiving end of a big revolving cylinder from a conveyor. As the load enters it is mixed with a flow of hard stars or jacks and the revolution and the inclination of the cleaner carry all toward the discharge end. As they pass along they are met by a number of streams of water. Some of these streams, under high pressure, tear into the cores, pockets and angles. Others, under a low pressure, carry the sand and bite, polish and burnish. Many streams of water are at work at many angles so that the entire surface of each casting is reached.

A large percentage of foundries now use hard iron stars or jacks as an aid in cleaning the castings. It is claimed that the addition of stars reduces the tumbling time from 20 to 50 per cent, improves the quality of the finish, and reduces the total cleaning cost.

One manufacturer of stars recommends a flat, 1½-inch, five-point star for cleaning flat surfaces; a six-point 1½-inch star for cleaning hardware and heavy stove castings, a six-point star, ⅞ inches in diameter or 1-inch in diameter for light hardware, stove castings, etc., and six-point 2-inch stars for cleaning heavy castings of all kinds. A large percentage of the space remaining in the mill after the castings have been loaded is filled with stars. These circulate freely among the castings and clean all surfaces thoroughly and quickly. It is recommended that about 25 pounds of stars per cubic foot of loading space be used.

This is the fourth of a series of articles dealing with cleaning room equipment. The fifth, which discusses grinding equipment, will appear in an early issue.

Meet in London

The twentieth annual meeting of the Institute of Metals (London) was held in London, England, on March 7 and 8. The retiring president, Sir John Dewrance, presented the report of the council for the past year and then inducted the new president, Dr. W. Rosenhain, into the chair. Following the address of the president, papers were presented by S. Beckindale and H. Waterhouse, Max Haas, Ezer Griffiths and F. H. Schofield, R. Chadwick, Hugh O'Neill, F. S. Grimston, F. Hargreaves, W. L. Kent and W. A. Cowan.

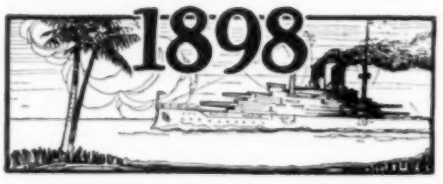
On the following day, March 8, papers were presented by G. L. Bailey, A. L. Norbury, J. Newton Friend and W. E. Thorneycroft, T. E. Alibone and C. Sykes, J. Newton Friend, and Tsuchu Matsuda.

D. K. Swartwout, Sr., president, the Swartwout Co., Cleveland, sailed March 3 for a vacation in the West Indies.

MILESTONES

in Foundry Progress

As Recorded in the April Issues of THE FOUNDRY, Thirty, Twenty and Ten Years Ago



HOW to make whiffle tree hooks and ferrules all on one gate was explained by W. H. Kremer in the leading article of THE FOUNDRY for April, 1898. The trick consisted in supplying a sand coated tube of steel placed in the cylindrical dividing portion where the ring of the ferrule surrounded the loop of the hook.

* * *

For the benefit of the uninitiated or the youngsters who never had to crawl up on the tongue of a wagon to fasten the inside traces to the whiffle trees, a whiffle tree hook was a cross between a universal joint and a steering knuckle with a slight leaning toward a spring shackle. It was made of malleable and four composed the set used on a two-horse wagon.

* * *

J. W. DuBois writing on the subject of producing straight castings mentions the difficulties attending the production of elevator fronts, long narrow pilasters, flanged on the inside. He recommends gating on the light side and stripping the heavy side.

* * *

Wonder if this is one class of work lost by the gray iron industry to structural steel and rolled shapes.

* * *

Various iron and steel trade and technical papers were toying with the idea that casting soon would be made from direct metal, that is from the iron as it comes from the blast furnace. Large mixers and the addition of alloying elements were suggested.

* * *

Noble Brothers Car Wheel Foundry, Rome, Ga., a shop which had cast brass cannon and iron shot and canister for the Confederate troops during the Civil war was dismantled, marking the passing of an old time establishment.

* * *

Sir Henry Bessemer, celebrated inventor of the steel making process that bore his name died March 1, 1898.

* * *

A writer commenting on German practice, which in that day, as in this, was viewed by a few individuals as markedly superior, reported that a glue solution was being used to revivify used sand.

* * *

A suggested method for shortening the annealing time of iron castings, presumably malleable, involved coating the castings with tallow or suet, with a sprinkling of ferromanganese and then packing the castings in a closed pot with sawdust, charcoal, turpentine and vinegar.

* * *

Sounds like the ancient recipe for tempering steel, consisting of water of radishes and earthworms as a quenching medium.

PAUL R. Ramp, familiar for many years through his writing on foundry subjects, described the molding of a 20-ton engine frame. This casting, poured in iron, was molded in green sand.

* * *

Pattern details and the method of molding a cast-steel clam shell were presented by H. J. McCaslin. The work described was made by the Wellman-Seaver-Morgan Co., Cleveland.

* * *

The second annual exhibition of foundry equipment, under auspices of the Chicago foundry foreman was described in detail. This exhibition was held at the Lewis institute, Chicago.

* * *

C. E. Hoyt was in charge of this show. Other well remembered names mentioned are Eugene W. Smith, C. C. Kawin, and E. H. Mumford.

* * *

An editorial pointed to the probable increase in the use of malleable iron castings in automobile manufacture. One car being built in 1908 *had no less than* 30 *parts made of malleable.*

* * *

This still was the period of the tonneau, brass lamps, carbide gas and the squeeze-honk horn.

* * *

No. 2 foundry pig iron was selling for $15.75 a ton, northern and $12.00 a ton, southern furnace, and foundry operations were at 50 per cent of capacity.

* * *

J. R. McWane, formerly connected with the Lynchburg Foundry & Pipe Works, Lynchburg, Va., was elected president of the American Cast Iron Pipe Co., Birmingham.

AN accurate shortage of all classes of pig iron was impending in the spring of 1918, according to THE FOUNDRY for April of that year. More than 50 per cent of the foundry capacity of the country was engaged on war work. Steel foundries were swamped with ordnance, transportation and replacement war work, while the scarcity of low phosphorus iron was hampering their production. A more equitable division of the available iron supply between foundries and steel works was urgently requested from the government.

* * *

Government control of prices was in effect. Scrap prices ranged from $25 *to* $40 *a ton.*

* * *

England was using permanent molds to produce cast-iron, trench mortar bombs. The method was described by M. Riddell, president of the Scottish branch of the British Foundrymen's association.

* * *

Millions of hand grenades were being made of malleable iron, according to an article by A. M. Jones, describing the practices followed at the plant of the Federal Malleable Co., West Allis, Wis.

* * *

H. Y. Carson, Central Foundry Co., New York, was appointed chief sanitary engineer for the Red Cross relief expedition being sent by the United States to assist General Allenby and the allies in Palestine.

* * *

Mr. Carson, who is a director of the American Foundrymen's association at present resides in Birmingham.

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ Work Well Begun

WILL the Pittsburgh conference held March 13, which launched the Gray Iron institute, leave its mark upon the industrial history of America? Has the groundwork been built for a new era of progress in gray iron castings manufacture? The answers lie with the small group of men chosen to draft the plan of organization to be presented at a meeting to be held in Philadelphia during the week of the American Foundrymen's association convention. These men were chosen by vote of the conference and many of them have been identified with the preliminary work which resulted in the Pittsburgh meeting.

THE personnel of the Pittsburgh conference was chosen carefully. A list of interested organizations was compiled by the Philadelphia Foundrymen's association and to this was added the names of outstanding foundry proprietors who had been nominated by various local national organizations of foundrymen. About fifty responded to invitations to the meeting. These men, after a day spent in considering various phases of the iron foundry problem, voted to establish a trade body to tackle this problem.

MUCH depends upon the wisdom with which the plan of organization of the Gray Iron institute is drawn. As was pointed out by one speaker at Pittsburgh, the problem largely is one of education. Foundrymen must be educated to the attainment of quality products. This involves the study and application of existing knowledge of cast iron, the exploration of new methods and technique, the attainment of uniformity and the ability to guarantee adherence to quality standards.

THE second phase, as mentioned by several speakers, is the education of the public, which means the buyers and users of gray iron castings. This undertaking is perhaps the more militant. It must not be expected that gray iron castings can regain all of the field which has been yielded to materials that have won their right to recognition through superior physical properties coupled with a price per unit which makes them more economical to use. However, encroachment by products that have supplanted gray iron castings by misrepresentation can be overcome. New uses can be developed. Bad business practices within the industry can be lessened if not eliminated. All these accomplishments are worthy, but perhaps the best result to be sought is a lessening of the inferiority complex, that quality of mind which has made of many gray iron foundrymen hapless individuals with no faith in their ability, their future or the worthiness of their industrial accomplishments.

¶ Foremen in the Van

EUROPEANS often point out that America's industrial supremacy is due to the immense output per man hour, and this in turn is attributed to the almost universal use of labor saving equipment. Undoubtedly, this is true but another factor has much to do with our industrial activity. As pointed out, much labor saving machinery is used in industry. This machinery is complicated and expensive and requires well-trained attendants which in turn requires better selected and equipped foremen.

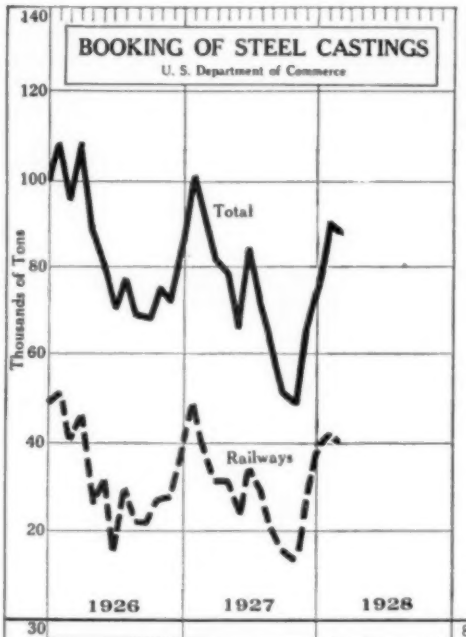
FOREMANSHIP training is receiving considerable attention at the present time according to a recent report by the United States chamber of commerce. The number of courses in this subject has increased from 105 in 1925 to 933 in 1927. Outstanding increases noted are in Connecticut which increased from 3 to 46; Michigan from 5 to 73 and West Virginia from 4 to 43. A number of advantages are stated to be gained by the foreman devoting his time to a study of a course relating to his field. His latent qualities of leadership are developed; it aids him in studying and analyzing his job and prepares him for positions of greater responsibility. Better understanding of human relationships in industry will result and the foreman better will appreciate the difficulties of a *green* employe. He will be able to co-operate better with the workmen, management and his fellow foremen.

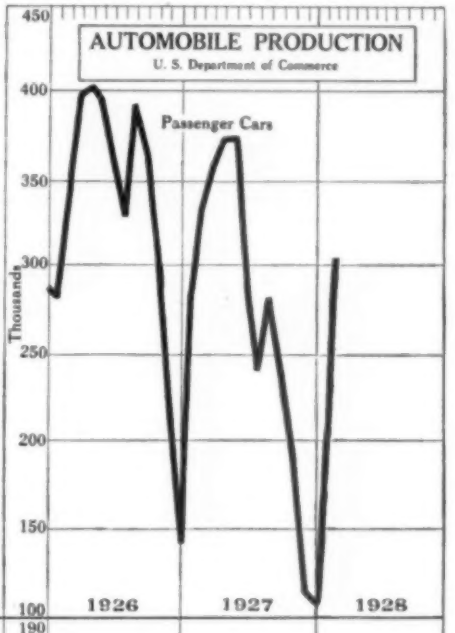
Trade Trends in Tabloid

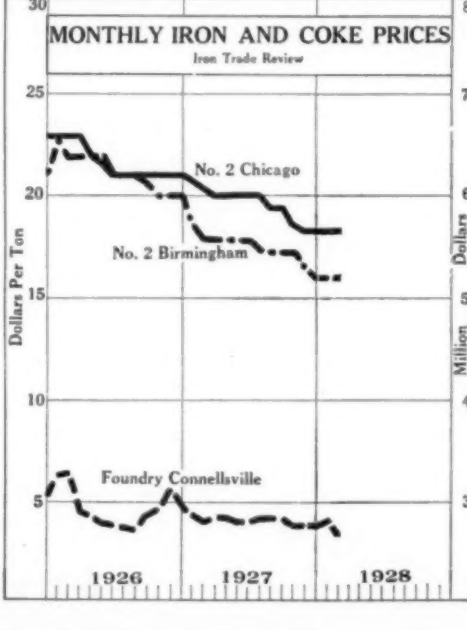
FOUNDRY operations are picking up with the advance of spring. General jobbing gray iron casting work is increasing in the Middle West and in portions of the East. Automotive production has shown a steady increase and cylinder jobbing shops are busy. Valve and fittings brass shops are active, many having been at capacity operation through the first quarter of the year. Cast-iron pipe shops report spring buying is increasing and prices have stiffened slightly. Orders for machine tools during February were at a high level and many foundries specializing on this class of work are busy. Unemployment which was severe during the winter shows signs of declining, although conditions are but little improved in the eastern states. Continued high totals of building awards promise activity in construction lines for the spring and summer. This is reflected in sales of sanitary ware, plumbing goods and miscellaneous casting requirements. Malleable foundry operation, bolstered up by heavier automotive and railway requirements is steady. Implement sales are holding up a fair rate of operation for foundries making this class of work. The steel industry is operating above 80 per cent of capacity and some foundry business is developing from this quarter. Bookings of steel castings declined slightly in February, according to the department of commerce. They are reported at 62 per cent of capacity.

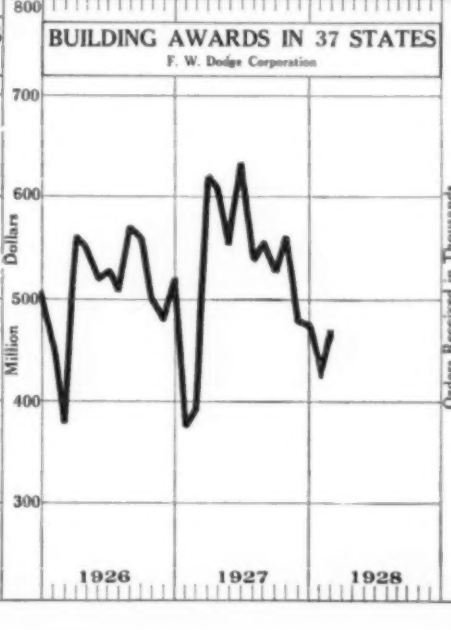
RAW MATERIAL PRICES
March 22, 1928

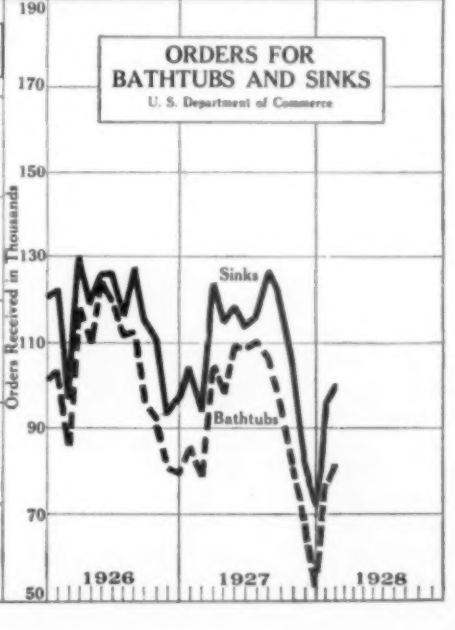
Iron	
No. 2 foundry, Valley	$17.25
No. 2 southern, Birmingham	16.00
No. 2 foundry, Chicago	18.50
No. 2 foundry, Philadelphia	20.76
No. 2 foundry, Buffalo	17.00
Basic, Valley	17.00
Basic, Buffalo	17.00
Malleable, Chicago	18.50
Malleable, Buffalo	17.50
Coke	
Connellsville foundry coke	$3.75 to 4.25
Wise county foundry coke	4.00 to 5.00
Scrap	
Heavy melting steel, Valley	$14.50 to 15.00
Heavy melting steel, Pitts	14.25 to 14.50
Heavy melting steel, Chicago	12.75 to 13.25
Stove plate, Chicago	12.00 to 12.50
No. 1 cast, New York	13.00 to 13.50
No. 1 cast, Chicago	14.00 to 14.50
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Pittsburgh	14.50 to 15.00
No. 1 cast, Birmingham	14.00 to 14.50
No. 1 cast, Buffalo	11.50 to 12.00
Car wheels, iron, Pittsburgh	14.25 to 15.00
Car wheels, iron, Chicago	12.75 to 13.25
Railroad malleable, Chicago	12.75 to 13.25
Agricultural Mal., Chicago	11.75 to 12.25
Malleable, Buffalo	15.00 to 15.50
Railroad malleable, Pitts	14.50 to 15.00
Nonferrous Metals	Cents per pound
Casting copper, refinery	13.80 to 13.85
Electro copper, producers	14.07½ to 14.12½
Straits tin	53.75
Lead, New York	6.00
Antimony, New York	10.00 to 10.25
Nickel, electro	37.00
Aluminum, No. 12, producers	23.00
Aluminum, No. 12, remelt	17.00 to 17.50
Zinc, East St. Louis, Ill.	5.67½











Comings and Goings of Foundrymen

Men of the Industry, Whose Activities Are Making Foundry History

FRED S. POWER, general manager of the St. Paul Foundry Co., St. Paul, has been elected president of the company, succeeding his father, Charles M. Power, who died recently. Mr. Power also has been elected treasurer, succeeding George I. Ashton, who continues as secretary.

George L. Edwards has been made superintendent of the Brazil Machine & Foundry Co., Brazil, Ind.

A. C. Good has been elected purchasing agent of the Hill Clutch Machine & Foundry Co., Cleveland, succeeding C. H. Kathe, who recently resigned.

O. R. Moller, Electric Steel Foundry Co. Inc., 1328 Second street, Berkeley, Calif., has been elected secretary of the East Bay Foundrymen's association.

Charles G. Burton, general manager of the National Sanitary Co., Salem, O., has been elected president of the company, succeeding J. E. Finefrock. Mr. Burton will continue as general manager.

George W. Page, director of purchases for the W. A. Jones Foundry & Machine Co., Chicago, has been chosen vice president of the company to succeed the late Thomas A. Jones.

Prof. R. S. McCaffery, college of mechanics and engineering, University of Wisconsin, Madison, Wis., addressed the St. Louis District Foundrymen's club Tuesday evening, March 20, on "Blast Furnace Practice and Its Influence on Production of Better Gray Iron Castings."

George B. Pickop, assistant general superintendent, Malleable Iron Fittings Co., Brantford, Conn., who recently underwent an operation for the amputation of his right leg, is recovering rapidly supported by an unusual optimism and bravery under his affliction. He is located at present at the Hollywood Apartments, Hollywood, Fla.

Bertram W. Burtsell has been elected president, director and general manager of Sargent & Co., New Haven, Conn., manufacturer of hardware, succeeding George Lewis Sargent, resigned. Mr. Burtsell has been president and general manager for the past eight years of McKinnon Industries Ltd., St. Catherines, Ont., and the McKinnon Dash Co., Buffalo.

William J. Chapin, formerly combustion engineer for the Peoples Gas, Light & Coke Co., Chicago, and more recently connected with the Eclipse Fuel Engineering Co., Rockford, Ill., recently has become connected with the Chicago Steel Foundry Co., Kedzie avenue and Thirty-seventh street, Chicago. Mr. Chapin will have charge of engineering and sales of the heat resisting alloy made by the Chicago Steel Foundry Co.

J. Frautschi has been appointed purchasing agent of the Bunting Bronze Co., Toledo, succeeding T. H. Niver.

W. W. Wilson, a banker of Milton, Pa., has been elected president of the reorganized Milton Mfg. Co., of that city, manufacturer of electric steel castings, etc., and will serve in that capacity until a new board of directors is elected. R. W. Krise continues as vice president.

Take Over Management

Recently the control and management of the Wolff Co., Chicago, manufacturer of plumbing fixtures, was taken over by 35 department heads, executives and foremen, of the firm. William J. Woolley, president of the new employe-controlled corporation, was formerly a plumber at Evansville, Ind., and attracted attention by forming a bureau to train master plumbers in business administration. Three years ago he came to Chicago and became associated with the Wolff Co. When reorganization was found necessary, Mr. Woolley interested his associates and S. W. Straus, New York banker. Associated with Mr. Woolley in the official management is William T. Mahoney, vice president in charge of production, who began as an apprentice in the foundry. Other officers are Henry I. Warden, vice president; Arthur H. Jolliffe, secretary, and O. P. Decker, treasurer.

Many of the employes have been associated with the firm for more than 30 years and have gained a place at the council table of management. They are Adolph Frech, chief patternmaker, 43 years; Frank Rioden, foreman, stores department, 44 years; John Bees, foreman, brass tubing department, 36 years; Peter Molls, foreman, assembly, 36 years; and John Loudin, foreman, enamel department, 33 years.

More on Cupolas

WHEREVER foundrymen meet, wherever men write or read of foundry matters, sooner or later the cupola demands attention. One of the oldest elements in castings manufacture, it stands today perhaps the most generally used of all melting mediums.

An unusual series of articles on cupolas and cupola operation has been written especially for THE FOUNDRY. These were prepared by a man whose early training has been along scientific metallurgical lines, but who in recent years has been in intimate daily contact with the faithful furnace of the gray iron foundry. The first article appears April 15. Watch for it.

Wisconsin Group Meets

The tenth regular monthly meeting of the Wisconsin Gray Iron Research group was held at the Republican house, Milwaukee, Wednesday evening, March 7. Dinner was served at 6:30 p.m. D. M. Houston, Foundry Engineer, International Nickel Co., New York, spoke on "Some Results of Recent Research on Alloys in Cast Iron."

Plan Meeting To Discuss Permanent Molds

The April meeting of the Detroit Foundrymen's association, to be held in Webster Hall, Thursday evening, April 19, will be devoted to a discussion of the latest development of the permanent mold. Papers will be read by J. Dostal, Holley Permanent Mold Co., Detroit and C. A. Nichols, Delco Remy Co., Anderson, Ind. Samples of castings made in permanent molds and motion pictures will be shown.

Considerable interest was shown at the meeting held March 15, the attendance being the largest in years. At that meeting, D. M. Houston, Foundry Engineer, International Nickel Co., New York, spoke on "Nickel and Nickel Chromium Gray Iron Castings." Harry Rayner, Dodge Bros., Detroit, presented an interesting paper entitled "Use of Mica in Core Wash."

Furnace Castings Crack

Question—What is the correct analysis for small and large pipe fittings, boiler sections and water fronts, and what would be the best iron if the same metal was put into all these castings? We are using an iron with from 2.50 to 2.90 per cent silicon in these castings and believe this high silicon is the cause of excessive cracking. If this does not cause the cracking, to what is it due?

Answer—You would probably get the most satisfactory results by using an iron with approximately 2.25 per cent silicon, less than 0.12 per cent sulphur, 0.5 per cent phosphorus, 0.7 per cent manganese, for the boiler sections. This same mixture could be used for the other castings but the silicon could be increased to approximately 2.5 per cent for the fittings and reduced to 2.0 per cent for the water fronts. However, larger fittings should have less silicon. It is difficult to say without a thorough examination what would cause the castings to crack. However, the cracking would hardly be caused by the silicon content. It is probably caused by the cores being too hard. It may also be due to the sand being unevenly wetted, or possibly the way the castings are cooled. Also, if the iron is oxidized in being melted, the castings would be apt to crack. The problem of cracked castings in this class of work is a rather difficult one and the only way the cause could definitely be determined, would be by personal examination of the operations followed in the manufacturing process.

Faked Foundry Facts

The Finishing Coat

Book Review

Lehrbuch der Stückzeit Ermittlung in der Maschinenformerei, by H. Tillmann, cloth, 158 pages, 6½ x 9¼ inches, published by R. Oldenbourg, Munich, Germany, and supplied by THE FOUNDRY, Cleveland, for $3.25; in paper for $3.00; in London, Penton Publishing Co. Ltd., 416-417 Caxton House, for 16s 3d, cloth and 15s, paper.

This book deals with the establishment of piece rates in the machine-molding foundry. The author has had considerable experience in this field as a member of the piece rate committee of the German Founders' association. All the necessary information to give a foundation to precalculate the finishing time in machine molding and to explain the possibilities of its application, are presented. The author has arranged the material into chapters dealing with piece wages in the foundry; time classification; time determination for the building up of piece wages; method of time measurement; recapitulation of the separate time values; basic time; basic time values for machine molding; etc. The book is in German and contains much information on piece rate setting as practiced in Germany.

Foundry Association Directory

American Foundrymen's Association
President, S. W. UTLEY, Detroit Steel Casting Co., Detroit; secretary-treasurer, C. E. HOYT, 140 South Dearborn street, Chicago; technical secretary, R. E. KENNEDY, 909 W. California street, Urbana, Ill. Annual convention in Philadelphia, May 14-18.

The Buffalo Foundrymen
Buffalo
President, J. MCARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings on third Wednesday of the month at 146 Chandler street.

Chicago Foundrymen's Club
Chicago
President, DAVID G. ANDERSON, Western Electric Co.; secretary, ALBERT N. WALLIN, S. Obermayer Co., 2563 W. Eighteenth street. Meetings second Saturday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association
President, FRED W. STICKLE, Capitol Foundry Co., Hartford, Conn.; secretary, C. S. NEUMANN, Union Mfg. Co., New Britain, Conn. Meetings are on second Friday of each month in various parts of the state.

Detroit Foundrymen's Association
Detroit
President, J. J. BOLAND, Griffin Wheel Co., Detroit; secretary, ROBERT HOPE, Holley Carburetor Co., Detroit. Meetings third Thursday in each month at Webster hall, Cass and Putnam avenues, Detroit.

East Bay Foundrymen's Association
Oakland, Calif.
Secretary, H. L. MARTIN, Marchant's Foundry Co., 4401 East Tenth street, Oakland, Calif.

Metropolitan Brass Founders' Association
New York
President, WILLIAM EMPER, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary, WILLIAM E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
Newark, N. J.
President, J. L. CARTER, Barlow Foundry Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meeting called by president.

New England Foundrymen's Association
President, CHARLES F. MILLER, Universal Winding Co., Providence, R. I.; secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio State Foundrymen's Association
President, C. C. SMITH, Toledo Steel Casting Co., Bancroft and Smond avenue, Toledo, O.; secretary-manager, ARTHUR J. TUSCANY, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
Philadelphia
President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary HOWARD EVANS, Union League club, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Southern Metal Trades Association
Atlanta, Ga.
President, GEORGE B. COCKER, Gastonia, N. C.; secretary, W. E. DUNN JR., Healy building, Atlanta, Ga.

Pittsburgh Foundrymen's Association
Pittsburgh
President, C. D. CAREY, American Steel Foundries, Pittsburgh, secretary-treasurer, WILLIAM J. BRANT, Wm. J. Brant, Bessemer building, Pittsburgh. Meeting on the third Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
Davenport, Iowa
President, HYMAN BORNSTEIN, Deere & Co., Moline, Ill.; secretary-treasurer, H. A. DEANE, Deere & Co., Moline, Ill. Meetings the third Monday of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Tri-City Technical Council
Moline, Ill.
Chairman F. V. SKELLEY, Tri-City Railway Co., Rock Island, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
Cincinnati
President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
Minneapolis-St. Paul
President, H. H. NOTT, Smith System Heating Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lynda'e avenue, south, Minneapolis. Meetings monthly at the Athletic club.

Washington Foundrymen's Club
Seattle
President, RONALD KUCHER, Olympic Foundry Co., Argo Station, Seattle; secretary, EDWARD C. GUSTIN, The Prescott Co., 1 West Lander street, Seattle. Meetings second and fourth Tuesdays of each month at the Elks Temple, Fourth avenue and Spring street.

Obituary

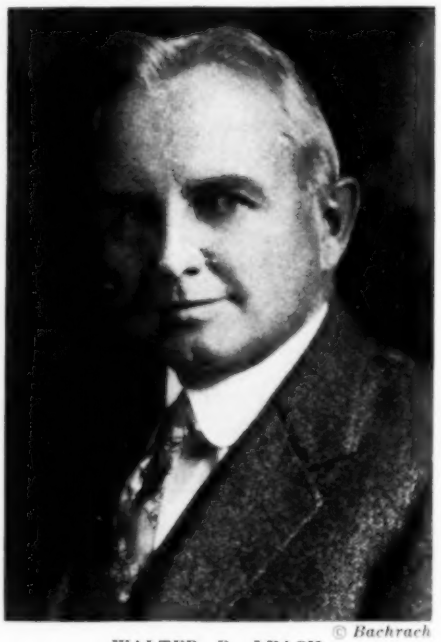
W. E. B. Partridge for over 40 years a resident of Los Angeles and vicinity and one of the founders of the Union Tool Co., Torrance, now affiliated with the National Supply Co., Toledo, O., died recently at his home in Redondo Beach, Calif., from an attack of heart failure. Mr. Partridge learned the molder's trade as a boy in Sydney Mines, Nova Scotia, where his father conducted a foundry operated in connection with several collieries the property of an English company known as the General Mining association, or more familiarly for nearly 100 years as the "Old G.M.A." Mr. Partridge went to California in 1886 and worked for a few years at his trade in the Los Angeles district. Then with a partner he started a little foundry and repair shop which expanded rapidly following the development of the oil fields in the West and Southwest. The plant was swamped with work during the war years. Its potential and intrinsic value was increased to a remarkable degree and shortly, afterward under a favorable arrangement with the former owners, the plant became affiliated with the National Supply Co., Toledo, specializing in oil field supplies. Mr. Partridge remained in active charge of operations until he retired three years ago at the age of 62. Since that time he has traveled extensively in Europe and elsewhere including an extended visit two years ago to the home of his childhood.

Peter J. McNamara, 77 years old, native of Ireland, founder and president of the McNamara-Koster Foundry Co., Indianapolis, died recently at his home, following a short illness. He founded the company with Louis Koster in 1890.

C. Arthur Schoessel, general superintendent of the John Deere Harvester Works, East Moline, Ill., died recently at his home at Rock Island, Ill., at the age of 37 years. He had been with the John Deere industries for 15 years, having been transferred from the Deere & Co. plant to the East Moline harvester works a few years ago.

Edward A. Jones, 63 years old, president and treasurer of E. D. Jones Sons & Co., Pittsfield, Mass., manufacturer of paper mill and other machinery, died at his home in that city Feb. 29. The business of which he was head, was established by Mr. Jones' father in 1867 and included several important machinery consolidations during the years until the present company was organized.

Walter B. Leach, president and general manager, the Hunt-Spiller Mfg. Corp., Boston, died at his home in Brookline, Mass., on March 13, after a prolonged illness. Mr. Leach was born in Boston Aug. 30, 1870, and first went to work in the railroad shops of the Old Colony railroad and the New York & New England railroad, now a part of the New York, New Haven & Hartford railroad. In 1902 he became master mechanic of the Boston & Albany railroad at Springfield, Mass. On Feb. 1, 1904, he was appointed general manager and treasurer of the Hunt-Spiller Co., later becoming president and general manager of the Hunt-Spiller Mfg. Corp.



WALTER B. LEACH © Bachrach

Lazard Kahn, 77 years old, president of the Estate Stove Works, Hamilton, O., died at his home in Cincinnati, March 7. Mr. Kahn was a chevalier of the legion of honor of France, having been decorated for his work in the Paris International exposition in 1900.

Charles W. Hessler, manager of the American Radiator Co.'s new plant at Gloucester, N. J., died at his home in Haddonfield, N. J., Feb. 14, after a 3-day's illness with pneumonia. Mr. Hessler was born at Syracuse, N. Y., 38 years ago, and was a member of a family long identified in a prominent way with the foundry industry. After attending Syracuse university, Mr. Hessler went with the American Radiator Co. He was manager of that company's Austin-Arcola plant at Buffalo when, last November, he was transferred to take charge at Gloucester.

Joseph Farris, owner and general manager of the Farris Furnace Co., Springfield, Ill., died recently after an illness of several weeks. He was born at Logansport, Ind., Oct. 22, 1863 and in early youth went to Springfield where he entered the employ of Joseph C. Lamb, proprietor of the Aetna foundry. He was promoted rapidly and when Mr. Lamb retired, Mr. Farris entered business for himself. In 1915 the Farris Furnace Co. was combined with the Capitol Foundry & Machine works. Mr. Farris was interested in civic affairs and served several terms as alderman for his district. He is survived by his widow, his daughter and three sons.

Richard F. Daly, at one time vice president of the International Molders' Union of North America and for many years foreman of the Simpson Iron Foundry, Brooklyn, died at his home recently at the age of 70.

Thomas Henry Hopkirk, eastern sales manager of the American Steel Foundries, New York City, died Feb. 14 at his home in that city, age 58. He had been ill for several months. Mr. Hopkirk was born in Toronto, Ont., and had been associated with American Steel Foundries for more than 20 years. At one time he was employed by the Erie railroad.

Harry W. Ward, 55 years old, president of the Pittsburgh Brass Mfg. Co., Pittsburgh, died at his home at La Jolla, Calif., Feb. 3. Mr. Ward had been ill for several years, and went to California in an effort to improve his health.

Charles F. Kinsman, chairman of the Sterling Bronze Co., New York, died recently at Sarasota, Fla., after a long illness. Born in San Francisco in 1867, he went to New York as a young man and entered manufacturing. He was a prominent maker of lighting fixtures for nearly 30 years, one of the organizers of the Sterling company.

Publishes Bulletin

Recently the engineering experiment station, University of Illinois, Urbana, Ill., published a bulletin on "The Surface Tension of Molten Metals with a Determination of the Capillary Constant of Copper." The investigations were conducted by Earl E. Libman and include a description of the apparatus used, experimental data, results obtained and the capillary constant of copper. The bulletin is No. 22 and copies may be obtained from the experiment station for 30 cents.

Blower Gives Constant Weight of Air

The General Electric Co., Schenectady, N. Y., recently has designed new cupola blowing equipment which, it is claimed, automatically insures the supply of a constant weight of air to the cupola, irrespective of atmospheric conditions and the resistance through the cupola. The new equipment will be manufactured with either hand or automatic control which can be set to give the proper weight of oxygen to meet varying operating conditions.

Constant speed motors are used with all sets except when direct-current motors are required. As a result, the weight of air flowing into the cupola is not controlled by varying the speed of the motor but by opening and closing the blast gate. This increases or decreases the resistance of the pipe line so that the total resistance through the pipe line and cupola is just sufficient to allow the proper weight of air to flow. When the resistance through the cupola increases, the blast gate is opened wider and the total resistance is kept the same. Likewise, when the resistance in the cupola decreases, the blast gate is closed so that the total resistance is kept the same and the weight of air flowing remains constant.

The equipment has totally enclosed bearings which are provided with forced lubrication. A gear-type oil pump, with a gravity feed from an oil reservoir located in the base of the main bearing housing, provides forced lubrication to all bearings. This pump is totally enclosed and immersed at all times in a bath of oil. The entire equipment is built compactly, requiring small floor space and a simple foundation.

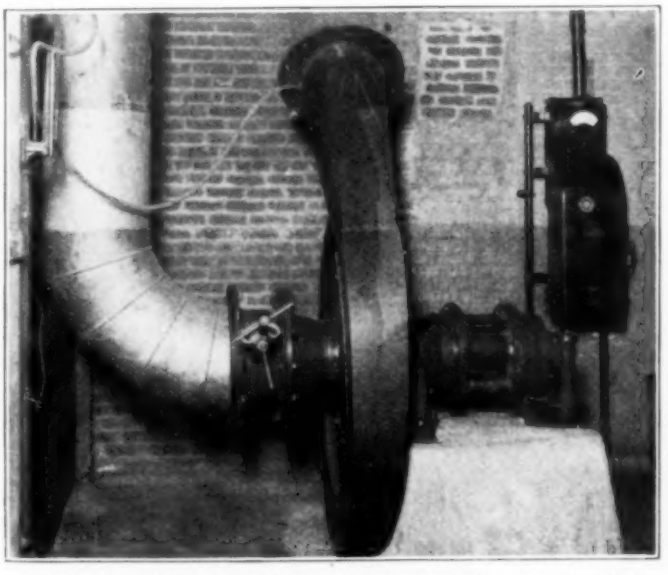
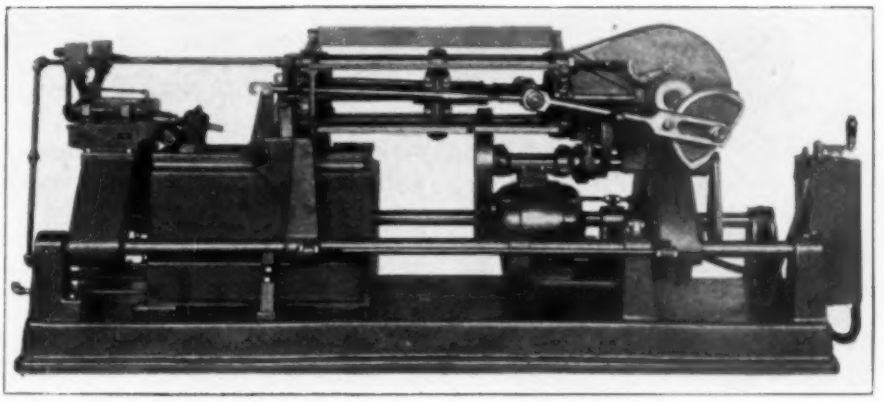


FIG. 1—A GATE CONTROLS AIR ENTERING THE CUPOLA



MOVEMENT OF THE DIE IS ACCELERATED AS THE TWO HALVES COME TOGETHER

Die Casting Machine Has Safety Features

Madison-Kipp Corp. Madison, Wis., recently has introduced a new die castirg machine. The operation of the machine is automatic and several safety features cover the movement of the metal, movement of the die, and movement of the cores. The standard zinc base and aluminum base metals may be used in the machine.

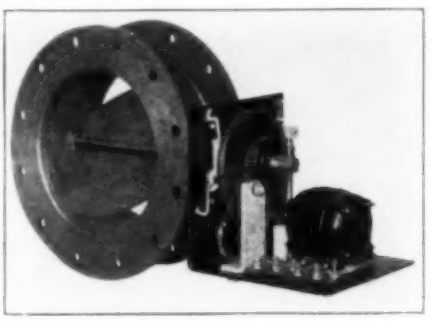


FIG. 2—AN AUTOMATIC CONTROL GATE MAY BE USED

As may be noted in the accompanying illustration the stationary half of the die is attached to the hot plate of the machine. The movable half of the die is mounted on the reciprocating carriage which is moved by rods connected to the slotted connecting rods eccentrically mounted on the crank cams. The movement of the die is accelerated as the two halves come together which gives sufficient speed to assure proper alignment. Conversely the greatest speed in the cycle is secured to break the die open and to start pulling the cores.

A goose neck automatically is dipped into the metal pot to be filled with metal and then is raised to the casting position under the die. A connection is made with the air chamber so that pressure may be applied to the metal to force the shot into the die. As soon as the metal enters the die the goose neck is lowered into the metal pot, thus breaking contact with the die and the air chamber. The machine is equipped with a fire brick lined cast iron furnace and a cast iron pot which may be removed from the furnace compartment. The furnace rests upon the base of the machine and may be removed if necessary. The machine is driven by a two horsepower multiple speed electric motor and may be operated at 4, 6, 8 or 12 shots per minute. Provision also is made for air and water cooling of the dies, for the mounting of splash guards and for the mounting of chutes to carry away the finished castings.

Develops Rosin Product

The Acme Products Co., Inc., De Quincy, La., recently has introduced a new type of rosin product applicable to the manufacture of cores. It is claimed that this product dissolves quickly and completely in any mineral oil or petroleum distillate, linseed oil or other vegetable oils and that the solutions remain clear indefinitely. The company has published a booklet giving complete information on this rosin product. The rosin is distributed by the General Naval Stores Co., 90 West street, New York.

T. F. Scannell has been appointed representative of the Magnetic Mfg. Co., Milwaukee, in the St. Louis territory with offices at 502 Ambassador building, St. Louis. Mr. Scannell formerly was connected with the Chain Belt Co., Milwaukee.

UNIT WITH HEAD REMOVED SHOWING THE BAFFLES

Removes Moisture from Air and Steam

The Andrews-Bradshaw division of the Blaw-Knox Co., Pittsburgh, recently has introduced a small purifier for air, steam or gas lines up to 3 inches in diameter. The unit consists of a casting, which is in effect an enlargement of the pipe in which it is placed. Five rows of gutter shaped baffles, which are made and staggered accurately, are placed in the enlarged section. When in operation, these baffles break up the air or steam into narrow ribbons approximately 7 inches in height and 1/20-inch in width. These ribbons of air, steam or gas as the case may be, are made to cover an exceedingly circuitous path through the baffles. The baffles remove the moisture or dirt in the vapor passing through the purifier, thus producing clean, dry air or steam. The moisture is drained away from the purifying unit by a weight operated steam trap.

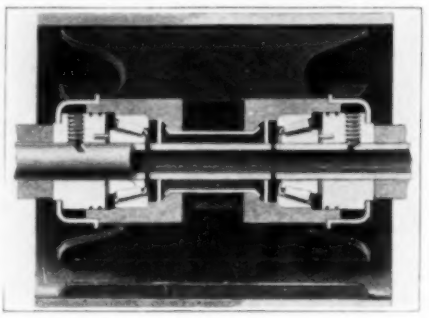
In saturated steam lines, it is claimed the unit removes all moisture, delivering standard specification steam free from all solids, both soluble and insoluble. Air for several pneumatic tools may be cleaned by one unit placed in the line near the tools. A view of the unit with the head removed and the baffles elevated, is shown in the accompanying illustration.

Standardizes Line of Belt Carriers

The Jeffrey Mfg. Co., Columbus, O., has standardized its line of belt carriers for belt conveyors. Now the same stands and bases may be used with any one of the three types of pulleys, namely, the plain bearing, the bronze bushed and the roller bearing. These gray iron pulleys are made with opened ends to minimize dust collection near the bearings. Rigidity of the walls is secured by three arms which join the hub and roll. Six ribs between the arms also provide additional lengthwise rigidity.

Pulleys with plain or bronze bushed bearings have hubs specially cored out to form large recessed grease pockets. These pockets are connected with pressure lubrication fittings at the end of the hollow shaft. It is claimed that the grease pockets are valuable on long belt conveyors where often a few pulleys may be overlooked at the regular oiling period. The reserve supply of grease contained in the grease pockets is sufficient to last until the next oiling. Plain bearing pulleys, which have been worn, may be drilled out and put back into service with new bronze bushings.

A special roller bearing pulley is made for belt conveyors which are used to carry materials that are severe on metal bearings. This roller



SECTIONAL VIEW OF BALL BEARING BELT CARRIER

bearing pulley is pressure greased, accurately fitted, and has five grease seals. The labyrinth construction provides five pairs of closely joined metal surfaces which prevent small abrasive substances from reaching the bearings. In addition the grease on the inside, which is under pressure, carries the dirt outward. A view of the roller bearing belt carrier is shown in the accompanying illustration.

C. Naas now is representing the Sterling Grinding Wheel Co., Tiffin, O. in the Detroit district. Mr. Naas previously was connected with the Packard Motor Car Co., Detroit, for about twenty years.

Makes Personnel Changes

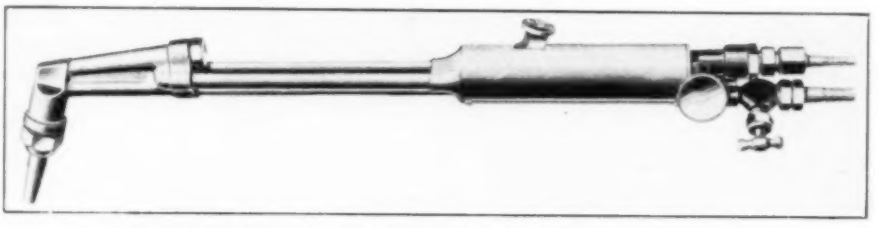
Several changes have been made in the executive staff of the manufacturing department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. W. J. Longmore has been transferred from the office of general purchasing agent to consulting supervisor of purchases. E. R. Norris has been promoted from director of works equipment to general works manager of all manufacturing operations. A. W. Bass, formerly director of works records and statistics, has been made assistant to the vice president. S. E. Marks has been transferred from director of traffic and shipping to director of traffic. C. G. Taylor, formerly director of purchases has been made general purchasing agent.

Moves To Larger Plant

Pulmosan Safety Equipment Co., Brooklyn, N. Y., recently has moved its office and plant from 386 Jay street to 176 Johnson street, Brooklyn, N. Y. Manufacturing facilities of the plant have been increased considerably. The company manufactures sandblast helmets, respirators and a line of safety equipment.

Eliminates Tube Bends in Cutting Blowpipe

A new cutting blowpipe, which it is claimed will not backfire under severe operating conditions, has been introduced by the Oxweld Acetylene Co., 30 East 42nd street New York. Although this blowpipe uses the same nozzles as a line previously manufactured by that company, several changes in design have been made. The three gas tubes are straight, having no bends either outside or inside the handle. The cutting valve is of the same design as has been used by that company for many years. Interchangeable nozzles are provided so that the blowpipe may be used with either medium or low pressure acetylene. The medium pressure nozzle cannot be used with low pressure acetylene although the low pressure nozzle can be used with medium pressure acetylene supply if low pressure is maintained in the hose and blowpipe.



EITHER HIGH OR LOW PRESSURE NOZZLES MAY BE USED

Uses Perforated Plates To Screen Sand

The Standard Sand & Machine Co., 5151 St. Clair avenue, Cleveland, recently has made a number of important changes in the design of its sand mixer for backing sand, facing sand or core sand. The 36-inch hexagonal screen is made up of six perforated steel plates supported by two spiders mounted on the main shaft. The feed end is a machined casting with the shaft spider cast integral. The trunnion tire seat is machined. The trunnion tire is 5 inches wide and is machined inside and out. The trunnion rolls are made of special high test metal which has been heat treated. The rolls are equipped with roller bearings made by the Timken Roller Bearing Co., Canton, O.

The upper section of the mixing trough is constructed on hinges to permit easy access to the inside of the mixer when it is necessary to clean the trough or renew the paddle tips. The inside of the mixing trough consists of white iron liners to reduce wear. The steel paddles have hard iron adjustable tips. The paddle shaft is equipped with roller bearings. Power is supplied by an electric motor through a worm speed reducer built by the Horsburgh & Scott Co., Cleveland.

Sand is delivered to the screen feed spout by a conveyor. The screen spout consists of a casting which fits accurately the machined opening in the head of the screen end. While the screen shaft is in the horizontal position, the plates are built at an angle so that the screenings move by gravity toward the discharge end of the machine. The unit shown in the accompanying illustration is a 15 cubic foot batch mixer which will handle 25 tons of sand an hour as a continuous mixer.

Name Meeting Dates of London Institute

The annual meeting of the Iron and Steel Institute of London will be held on May 3 and 4. At this meeting Benjamin Talbot will assume office as president for the ensuing year and the meeting will take place under his presidency. The autumn meeting will be held at Bilbao, Spain, by invitation of members of the institute residing in Bilbao and will begin on Sept. 24. After the meeting excursions to Madrid, Toledo, Sagunto and Seville are contemplated. Papers offered for publication are submitted to a publication committee which reports to the council and authors are advised that the latest dates for receiving papers are Feb. 28 for the annual meeting and June 25 for the autumn meeting.

Equipment Men To Meet at French Lick

The Foundry Equipment Manufacturers association has announced that its spring meeting will be conducted at French Lick Springs hotel, French Lick, Ind., April 18-19. H. Cole Estep, 1213 West Third street, Cleveland, is secretary-treasurer.

Shows Grinding Pictures

Five reels of motion pictures entitled "Jewels of Industry," were shown to the members of the Pittsburgh Foundrymen's association at the March meeting held in the Fort Pitt hotel, March 19. The pictures were accompanied by a lecture by Vernon W. Wells, Carborundum Co. of America, Niagara Falls, N. Y.

Sells Sand Equipment

Royer Foundry & Machine Co., Wilkes-Barre, Pa., has sold sand separators and blenders to the J. I. Case Threshing Machine Co., Racine, Wis.; Home Aluminum & Bronze Co., Piqua, O.; Michigan Malleable Iron Co., Detroit; Portland Foundry Co., Portland, Conn.; Vermilion Malleable Iron Co., Hoopeston, Ill.; Warren Foundry & Pipe Co., Phillipsburg, N. J.

Equipment Orders Gain

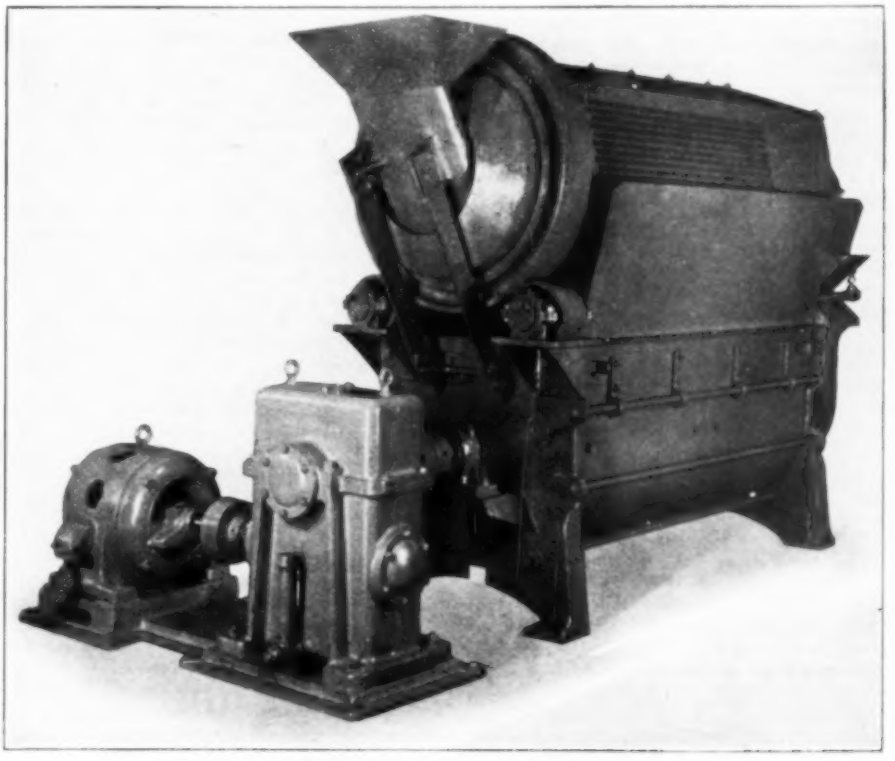
The index of gross orders for foundry equipment in January was 129.7 as compared with 106.8 in December, according to a report of the Foundry Equipment Manufacturers' association. The index of shipments was 116.4 in January against 110.4 in December. Unfilled orders increased from 103.5 in December to 110.7 in January. The base is the average monthly shipments for the years 1922-23-24. Comparisons of monthly orders follow:

	1924	1925	1926	1927	1928
Jan.	141.8	104.2	168.2	180.4	129.7
Feb.	121.0	108.8	154.9	198.0	.....
March	121.9	159.3	157.3	131.1	.....
April	146.8	124.3	113.2	130.0	.....
May	108.4	113.3	128.5	124.8	.....
June	96.4	110.5	133.5	138.4	.....
July	62.8	117.0	127.3	89.9	.....
Aug.	77.5	190.0	141.2	106.4	.....
Sept.	66.0	84.2	114.0	80.4	.....
Oct.	85.5	149.5	140.5	98.0	.....
Nov.	91.4	180.3	133.4	95.8	.....
Dec.	137.8	140.1	181.0	106.8	.....

Is Sales Manager

David Adams has been appointed sales manager of the steel foundry department of the W. G. Riddell Co., Bucyrus, O. Through an error he was reported as having been made foundry superintendent of the firm in the Feb. 15 issue of THE FOUNDRY.

W. R. Bean, president, Grindle Fuel Equipment Co., Harvey, Ill., spoke before the Quad-City Foundrymen's association, Davenport, Iowa, March 19 on "Relation of Melting Furnace Operation to Cost and Quality of Malleable Castings."



ROLLER BEARINGS ARE USED ON THE SAND MACHINE

What the Foundries Are Doing

Reflecting the Activities of the Gray Iron, Malleable, Steel and Brass Shops

Central Iron Works, Hagerstown, Md., recently completed a foundry.

Blake Specialty Co., Rock Island, Ill., will build a foundry addition.

Grimsby Foundry Co. Ltd., 23 John street, Grimsby, Ont., is planning an addition to its foundry.

National Cast Iron Pipe Co., Birmingham, Ala., is building plant additions and increasing its plant capacity.

International Harvester Co., Springfield, O., has awarded the structural steel contract for a plant addition.

Big Four Foundry Co., Tulsa, Okla., has been incorporated with $25,000 capital by J. L. Smith, 2200 W. 21st St.

Hayes-Custer Stove & Furnace Co., Bloomington, Ill., expects shortly to build a 50 x 100-foot addition to its foundry.

Sully Brass Foundry Ltd., 2388 Dundas west, Toronto, Ont., has purchased the foundry building on the south side of Wabash avenue, which will be equipped for a brass foundry

Salem Iron Works, Salem, Oreg., will install additional machinery for the manufacture of paper mill specialties and other types of machinery.

K. & M. Brass & Aluminum Castings Co., Beechwood, O., has been incorporated with $15,000 capital by Albert F. Misch, Richard S. Male and Edward J. Kortan.

National Sanitary Co., Salem, O., has awarded a contract for a new plant to replace the one recently burned. (Noted Feb. 15).

Superior Die Casting Co., Cleveland, has moved into its new plant at 875 East Seventieth street, where enlarged facilities are available.

Midwest Die Casting Co., Milwaukee, which was incorporated a year ago, now is in production of tools, dies and die castings. G. R. Hinz is president.

Olney Foundry Co., 180 W. Duncannon St., Philadelphia, is making plant additions and also is making changes in the present foundry building.

Electric Steel Castings Co., St. Joseph, Mich., recently was placed in operation. This company manufactures small castings and uses electric furnace melting. (Noted March 15).

T. J. Eansor & Sons Ltd., Windsor, Ont., has been incorporated to carry on the business of iron founder and manufacturer of machinery, with $150,000 capital by Thomas J. Eansor, William J. Eansor, and Norman D. Eansor.

D. A. Currie, vice president and general manager, Erie Foundry Co., Erie, Pa., has acquired the entire stock holdings of the A. N. Bates estate and thereby has become the dominant interest in the Erie Foundry Co.

Amherst Foundry Co. Ltd., Amherst, N. S., and Charles Fawcet Ltd., Sackville, N. B., have merged under the name of the Enamel & Heating Products Ltd. Both companies do an extensive business throughout the dominion and their combined assets exceed $1,000,000.

A. Mason, 130 McRoberts avenue, Toronto, Ont., has let contract to W. H. Little, 63 Edna avenue, for the erection of a 1-story foundry, 80 x 200 feet, on Brandon avenue near Dufferin street. Machinery and tools for the proposed plant will be purchased.

Huron Gray Iron Foundry, Ypsilanti, Mich., recently let the contract for a new foundry building 50 x 90 feet and a cupola room 20 x 30 feet. The new building which will be located at 824 Railroad street, will be equipped with a 5-ton traveling crane. Arthur Corbeille is manager.

Josiah Anstice & Co. Inc., Rochester, N. Y., is building an addition to their foundry which will provide 25 per cent additional floor space as well as a fireproof storage vault for patterns. Exceptionally satisfactory business is reported by that company which has been operating every week day since last fall.

Nugent Steel Castings Co., Chicago, has installed a complete substation in its plant, in collaboration with the Commonwealth Edison Co. This eliminates any possible difficulty in operation and makes a shut-down for lack of power practically impossible. The company consumed 5,623,400 kilowatt hours of electric energy in 1927.

Bose-Brooks Pattern Works, 482 Market street, Milwaukee, has been started recently for the manufacture of wood and metal patterns, by H. A. Bose and W. A. Brooks.

St. Clair Foundry Co. plant at Bellevi'le O., which has been idle 18 months, has been taken over by William Kesberg and associates and will be placed in operation at once on stove plate jobbing work.

Vingren Pattern Works, Kenosha, Wis., has been formed recently to manufacture metal and wood patterns. H. Vingren, president of the company, has been in the pattern trade for over 20 years, with Crane Co., Chicago, and the Nash Motors Co., Kenosha.

Doehler Die Casting Co., New York, has leased the nineteenth floor of a building at Fourth avenue and Twenty-seventh street, for executive offices. Its plants are at Brooklyn and Batavia, N. Y., Toledo, O., and Pottstown, Pa.

New Trade Publications

HOISTS—American Engineering Co., Philadelphia, has issued an illustrated bulletin on its hoist designed for use where headroom is small.

WELDED PIPING—The Linde Air Products Co., 30 East 42nd street, New York, recently has issued a booklet describing the method of installing heating and plumbing systems.

INDUSTRIAL BUILDINGS—Truscon Steel Co., Youngstown, O., presents in a bulletin a variety of buildings made up of standardized units.

ARC WELDERS—A bulletin on its flexible arc welders has been issued by the Fusion Welding Corp., Chicago. The publication covers stability, excitation, current control, weld quality, cost, capital investment and design.

NICKEL ALLOY STEEL—International Nickel Co., New York, has issued a revised buyers' guide. It contains a list of sources from which the company's products may be obtained. The sources are presented under product headings.

HOISTS—Silent Hoist Winch & Crane Co., Brooklyn, N. Y., in a current bulletin features various types of its vertical and horizontal capstan winches and single and double-drum winches with electric or gasoline drive. It is well illustrated to show a wide variety of uses.

MAGNETIC PROTECTION—A book by Cutler-Hammer Mfg. Co., Milwaukee, describes the company's magnetic separator pulleys. It describes design and construction of these pulleys. Tables give cubic feet per hour capacity of all sizes and correct width and thickness of belts to be used.

DIRECT CURRENT MOTORS—An additional catalog section has been made up by the Reliance Electric & Engineering Co., Cleveland, covering its heavy duty motors for direct current, with ball and roller bearings. It is illustrated, showing various motors and details of their construction.

ELECTRICAL SUPPLIES — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has issued a new catalog of electrical supplies, presenting all electrical and mechanical features and applications of all supply equipment and appliances manufactured by this company, and a representative line of large motor and generating equipment. New developments include network protectors, transformers, regulators and relays designed especially for low voltage alternating current distribution networks.

CHAIN DRIVES—Morse Chain Co., Ithaca, N. Y., has prepared a handbook on chain drives covering the subject of silent chain power transmission to facilitate selection and design of proper drive for various requirements. A section is devoted to illustration and description of chain drives on various types of industrial machinery.

ROTARY METERS—Connersville Blower Co., Connersville, Ind., is sending out a bulletin on its rotary displacement meters of smaller capacities. Two sizes are described, suited to control and accounting of gas consumption in large steel mills and gas burning departments of iron and steelworking plants, chemical plants and other users of gas for industrial purposes.

COMPRESSED AIR EQUIPMENT—The Sullivan Machinery Co., 122 South Michigan avenue, Chicago, recently has issued several bulletins describing belt-driven, single stage, air compressors; and direct motor-driven, vertical air compressors. The company also has supplemented its regular bulletins with a booklet devoted to various uses of compressed air. The bulletins are well illustrated.

SCREW CONVEYORS—Link-Belt Co., Chicago, through its subsidiary, H. W. Caldwell & Son Co., has issued a booklet devoted to screw conveyors. It supersedes all previous catalogs and bulletins on this subject. Both the helicoid and sectional flight types are covered. Complete data, arranged for convenient reference, are included. It is illustrated to explain the appearance and use of various types. Accessories are included.

VENTILATING FANS—An unusual volume has been issued by the B. F. Sturtevant Co., Hyde Park, Boston. It is titled "The Eighth Wonder" and deals with the Holland vehicular tunnel connecting New York and Jersey City. The Sturtevant Co. designed and built the ventilating equipment for renewing air in the tunnel bores. An engrossing story of the design and construction of the tunnel is told.